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# ERRATA.

Page	18	line	21	for	" <i>Pergandeidia</i> "	read	" <i>Pergandeida</i> "
"	58	"	38	"	" <i>Bothynoderes</i> "	"	" <i>Conorrhynchus</i> "
"	79	"	30	"	" <i>Podistus</i> "	"	" <i>Podisus</i> "
"	84	"	19	after	" <i>T. (A.) rosana</i> , L., insert	" <i>T. (A.) rosaceana</i> , Harr.,"	
"	84	"	28	for	"as larvae in Canada"	read	"as larvae in the case of <i>T. rosaceana</i> in Canada"
"	115	"	10	for	" <i>Tryonymus</i> "	read	" <i>Trionymus</i> "
"	122	"	4	"	" <i>Agahis</i> "	"	" <i>Agathis</i> "
"	124	2	lines	from	end for " <i>euonymellae</i> , Ratz."	read	" <i>ypono- mentae</i> , Rond."
"	152	line	43	for	" <i>nerifolia</i> "	read	" <i>neriifolia</i> "
"	153	3	lines	from	end for "July, 1883"	read	"July, 1833"
"	165	line	35	for	"7 per cent. powder"	read	"1 per cent. powder"
"	168	"	14	"	"fruit-fly"	read	"frit-fly"
"	216	"	28	"	"This is the final report"	read	"This is a review of the final report"
"	236	"	2	"	" <i>putripenella</i> "	read	" <i>putripennella</i> "
"	289	"	14	"	"this solution to wash"	read	"this solution ought to wash"
"	292	"	35	"	" <i>Reculitermes</i> "	read	" <i>Reticulitermes</i> "
"	304	"	11	"	"CORY (E. M.)."	"	"CORY (E. N.)."
"	318	"	5	"	" <i>N.Z. Jl. Agric.</i> , xxiv"	read	" <i>N.Z. Jl. Agric.</i> , xxxiv"
"	318	"	29	"	"( <i>Monophadanoides</i> )"	read	"( <i>Monophadnoides</i> )"
"	383	"	1	"	"FRIEDRICHS"	read	"FRIEDERICHS"
"	402	"	31	"	" <i>Cerotoma</i> "	"	" <i>Ceratoma</i> "
"	405	lines	19	and	28 for " <i>buoliana</i> , Schiff."	read	" <i>frustrana bushnelli</i> , Busck"
"	405	line	19	delete	from "which . . . 1876"		
"	438	"	30	for	" <i>C. transversogutta</i> "	read	" <i>C. transversoguttata</i> "
"	449	"	41	"	" <i>Ocromeigenia</i> "	read	" <i>Ochromeigenia</i> "
"	491	"	12	"	"YOKOHAMA"	"	"YOKOYAMA"
"	495	"	16	"	"recorded in America"	read	"recorded on wheat in America"
"	507	"	18	"	" <i>bipunctatus</i> "	read	" <i>bipustulatus</i> "
"	518	"	41	"	" <i>Pergandeidea</i> "	"	" <i>pergandeida</i> "
"	530	"	20	"	"elm bark aphid"	"	"elm bark scale"
"	549	"	20	"	" <i>Aulocosternum</i> "	"	" <i>Aulacosternum</i> "
"	630	"	5	"	" <i>T. pellionella</i> , L."	"	" <i>Tinea pellionella</i> , L."
"	630	"	6	"	" <i>Trichographa</i> "	"	" <i>Trichophaga</i> "
"	656	"	21	"	" <i>thrax</i> , Moore"	"	" <i>thrax</i> , L."
"	665	"	18	"	"KEENAN (W. H.)."	"	"KEENAN (W. N.)."



REVIEW  
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GRANOVSKY (A. A.). **The Control of Grasshoppers by Airplane Dusting.**  
—*Jl. Econ. Ent.*, xix, no. 5, pp. 791-795, 4 refs. Geneva, N.Y.,  
October 1926.

A brief review is given of some of the Russian literature dealing with the control of the migratory locusts, *Locusta migratoria*, L., and *Calliptamus italicus*, L., by dusting from aeroplanes, most of which has already been noticed. Arsenical dusts have been used with varying results. Disodium acid arsenite and disodium acid arsenate dusts were used with striking success against locusts when they were on the wing, thus indicating that certain arsenicals can probably be used as contact insecticides.

FELT (E. P.). **Pales Weevil in a new Rôle.**—*Jl. Econ. Ent.*, xix, no. 5,  
p. 795. Geneva, N.Y., October 1926.

*Hylobius pales*, Boh., which is well-known to attack the stems of young pines, has recently been observed in New York State infesting a recent planting of Scots pines [*Pinus sylvestris*] some 15 years old at the base of the trees below the surface of the ground. In late July and August, larvae, pupae and adults were found working in the cambium, badly infested trees being entirely girdled below the surface and the injury extending in some instances for several inches along the principal roots. The infestation apparently originated from old pines adjacent to the new planting.

MARCOVITCH (S.). **The toxic Values of certain Fluorides.**—*Jl. Econ. Ent.*, xix, no. 5, pp. 795-796. Geneva, N.Y., October 1926.

A suggestion has been made by R. C. Roark [*R.A.E.*, A, xiv, 272] that some of the more insoluble fluorides, such as calcium, magnesium and strontium fluoride, might give as good insecticidal results as sodium fluosilicate without injury to foliage. The author has recently found by experiment that neither calcium nor magnesium fluoride showed any toxicity towards *Leptinotarsa decemlineata*, Say (Colorado potato beetle), and strontium fluoride gave only 25 per cent. mortality in 48 hours, while sodium fluosilicate diluted with two parts of hydrated lime killed 95 per cent. in 24 hours. Roark maintained that commercial

sodium fluosilicate contains sodium carbonate and that this would tend to decompose the fluosilicate with the formation of fluorides. The author has been unable to detect any sodium carbonate in samples examined. He has been making toxicological tests, which will be reported on in the near future. These tests show that sodium fluosilicate is about 10 times more effective than sodium fluoride against certain insects when calculated on a gram-molecular basis. It would appear for insecticidal purposes that fluosilicates are more effective than relatively insoluble fluorides; that the former kill more rapidly than the latter, are more readily obtained commercially in a form suitable for dusting, and are cheaper.

**Common Names of Insects approved for General Use by American Association of Economic Entomologists.**—*Jl. Econ. Ent.*, xix, no. 5, pp. 797-799. Geneva, N.Y., October 1926.

This list, which is supplementary to a previous one [*R.A.E.*, A, xiii, 429], contains 65 additional names.

DOZIER (H. L.). **Crepe Myrtle Plant Louse.**—*Jl. Econ. Ent.*, xix, no. 5, p. 800, 1 ref. Geneva, N.Y., October 1926.

The crepe myrtle (*Lagerstroemia indica*), widely used as an ornamental shrub in the Gulf States, is frequently attacked by *Myzocallis kahawaluokalani*, Kirkaldy. This Aphid sometimes produces complete defoliation, or the foliage is rendered unsightly by the black sooty mould that grows in its honey-dew secretion. In the Gulf Coast section it is attacked by the Coccinellid, *Olla abdominalis sobrina*, Casey, and a species of *Chrysopa*. Notes on its distribution in the United States are given.

AINSLIE (C. N.). **Notes on the recent Outbreak of *Toxoptera graminum*.**—*Jl. Econ. Ent.*, xix, no. 5, pp. 800-801. Geneva, N.Y., October 1926.

*Toxoptera graminum*, Rond. (green bug) attacked cereals in Minnesota in the spring and summer of 1926, causing damage comparable with that of 1907, when the loss in Oklahoma and Kansas was estimated at about £3,000,000.

It seems probable that the winter or self-sown wheat well to the south of Iowa, given an early start by the unusual warmth of the early spring, produced the myriads of Aphids, which, rising into the air (as in 1907) only when the wind was from the south, were borne northward over Iowa and Minnesota and possibly on into Canada. Apparently the Aphids reached Minnesota too late to damage early sown grain, so that uninjured fields were found next to ruined ones. Oats suffered particularly, probably owing to their being sown later than either wheat or barley. The unusually dry summer checked the rapid growth of the plants, so that they were more susceptible than usual to Aphid attack. By July the damage had been done, and most of the last generation of Aphids had flown farther north.

Although large numbers of Coccinellids were present in the grain fields, especially towards the middle of July, the Aphids appear to have stayed too short a time in Minnesota to allow their enemies to increase sufficiently to check them. The Braconid parasite, *Lysiphlebus*

(*Aphidius*) *testaceipes*, Cress., which so completely controlled this Aphid in Kansas in May 1907, was noticeably absent in Minnesota, though it is probable that its larvae and those of the Coccinellids really destroyed large numbers.

**Quarantine on account of Gipsy Moth and Brown-tail Moth. Revised Rules and Regulations Supplemental to Notice of Quarantine, No. 45.**—U.S. Dept. Agric., Fed. Hort. Bd., S.R.A. no. 87, pp. 44-48. Washington, D.C., September 1926.

These revised Rules and Regulations, which came into force 1st July 1926 and supersede previous ones [R.A.E., A, xii, 578], revise the areas designated as infested with *Porthetria dispar* and *Nygmia phaeorrhoea* (*Euproctis chrysorrhoea*).

**Gipsy Moth Quarantine in Western New England Area to be lifted July 1, 1926.**—U.S. Dept. Agric., Fed. Hort. Bd., S.R.A. no. 87, pp. 48-49. Washington, D.C., September 1926.

Certain areas of Vermont, Massachusetts and Connecticut, quarantined on account of *Porthetria dispar*, are released from quarantine as from 1st July 1926.

**Quarantine on account of Japanese Beetle. Notice of Quarantine No. 48, with Regulations (Fourth Revision).**—U.S. Dept. Agric., Fed. Hort. Bd., S.R.A. no. 87, pp. 51-58, 1 map. Washington, D.C., September 1926.

The previous revision of Quarantine no. 48, with the supplementary Rules and Regulations [R.A.E., A, xii, 447], is here superseded as from 15th May 1926. The area quarantined on account of *Popillia japonica*, Newm., is revised; an additional requirement is that no farm products, nursery or ornamental stock, sand, soil, earth, peat, compost or manure may be moved out of, or through, regulated areas without being satisfactorily protected from infestation.

GUBA (E. F.). **Injury to Glasshouse Plants from Hydrocyanic Acid Gas, following the Application of Copper Fungicides.**—*Phytopathology*, xvi, no. 9, pp. 633-634, 3 refs. Lancaster, Pa., September 1926.

To avoid injury to plants, the fumigation of greenhouses with hydrocyanic acid gas should be carried out one or two days before the use of Bordeaux mixture or of copper sulphate and lime dust, or tobacco fumigants should be used instead of the cyanide. Cyanide fumigation should never immediately follow the use of copper sulphate.

ROSEN (H. R.). **Negative Results obtained by the use of Paradichlorobenzene against the Root-Nematode, *Heterodera radicicola*.**—*Phytopathology*, xvi, no. 9, pp. 635-636. Lancaster, Pa., September 1926.

Exhaustive experiments with a view to ascertaining if the liberation of paradichlorobenzene in the soil would destroy *Heterodera radicicola*, Greef, showed it to be ineffective against this Nematode.

BROOKS (A. N.). **Studies of the Epidemiology and Control of Fireblight of Apple.**—*Phytopathology*, xvi, no. 10, pp. 665–696, 43 refs. Lancaster, Pa., October 1926.

The most important insect disseminators of fire blight [*Bacillus amylovorus*] in experimental apple orchards in Wisconsin were found to be, in addition to bees, *Aphis avenae*, F., *A. pomi*, DeG., and *Empoasca fabae*, Harr. (*mali*, LeB.). The leaf-hopper is apparently capable either of spreading the blight directly, or of so puncturing the leaves that infection may take place by means of rain-borne inoculations. Aphids were found feeding upon drops of bacterial exudate and also in the nectar of the flowers, and may be a factor in the initial infection of blossoms. Control of Aphids therefore reduces the chances of blight development early in the season, and when there is a light bloom on the trees, it would probably do much to control fire blight in a given orchard, even though neighbouring orchards were infected. If the bloom is heavy, however, a blight epidemic may be started by pollinating insects. In view of the fact that the chief dissemination of blossom blight commonly occurs during the latter part of the blooming period, attempts were made to limit the spread of this phase of the disease through the use of bee-repellent sprays, after sufficient pollination had been accomplished, but without success.

JOHNSON (J.). **Some Points of View on the Plant Virus Problem.**—*Phytopathology*, xvi, no. 10, pp. 745–751. Lancaster, Pa., October 1926.

Although it is generally accepted that insects are largely, if not entirely, responsible for outbreaks of most virus diseases of plants, the author is not convinced that they play a major part in the occurrence of tobacco mosaic. Experiments indicating that an infectious disease can be transmitted only by insects, or by grafting, need to be performed with great care in order to be wholly convincing.

DAVIS (J. J.). **Insects of Indiana for 1925.**—*Proc. Indiana Acad. Sci.*, xxxiv (1925), pp. 303–319, 7 figs. [Indianapolis, Ind.] 1926.

It is intended to publish annually a record of the insects of the season in Indiana, accompanied by an account of the weather conditions. Weather conditions in 1925 were in general favourable to insect attack. Although *Pyrausta nubilalis*, Hb. (European corn borer) has not yet reached Indiana, it is expected, at its present rate of spread, to do so within the next two or three years. Arrangements are therefore being made to introduce and acclimatise the European parasite, *Microbracon* (*Habrobracon*) *brevicornis*, Wesm., and to establish it on the common smartweed borer [*Pyrausta ainsliei*, Heinr.] in time to meet the corn borer on its arrival in the State. *Epilachna corrupta*, Muls. (Mexican bean beetle) appeared in five of the south-eastern counties of Indiana in 1924, and in 1925 caused serious injury to garden beans in all localities. It is expected that heavy damage will be done to soy-beans [*Glycine hispida*] if the numbers increase rapidly on garden beans.

In addition to the more important pests, many of which were mentioned in the previous report [*R.A.E.*, A, xiii, 262], the following less common ones were among those recorded in 1925: the billbugs,

*Sphenophorus zeae*, Walsh, *S. parvulus*, Gyll., and other species, heavily infesting maize; *Miris dolabratus*, L. (meadow plant bug), attacking developing heads of wheat; *Eucolaspis* (*Colaspis*) *brunnea*, F. (clover white grub), the adults of which attacked strawberry, melon, grape, snap beans and soy-beans during July; *Systema taeniata*, Say (banded flea-beetle), which was unusually abundant following a rank growth of weeds in the moist autumn weather of 1924 and damaged maize, potatoes and garden vegetables; *Metachroma interruptum*, Say (apple fruit chafer), which first appeared in Indiana in 1922 and has done a certain amount of damage to apples each year since; and *Leptocoris trivittatus*, Say (boxelder plant bug), which was more abundant than ever before, and caused considerable injury to boxelder [*Acer negundo*].

PARKER (T.). **The Control of Red Spider.**—*Gard. Chron.*, lxxx, no. 2078, pp. 333–334. London, 23rd October 1926.

This information on naphthalene fumigation of greenhouses against *Tetranychus telarius*, L., has already been noticed [*R.A.E.*, A, xiii, 589].

LACROIX (J. L.). **Un mangeur occasionnel de cerises.** *Omophlus lepturoides* F.—*Bull. Soc. Etude Sci. nat. Elbeuf*, xliii (1924), pp. 98–103, 4 refs. Elbeuf, 1925.

A serious infestation of cherries by the Cistelid, *Omophlus lepturoides*, F., is recorded from Charente-Inférieure in May and June 1924. All the fruit is eaten from the stone, which remains hanging to the stalk.

PAILLOT (A.). **Rôle des microbes sporulés dans la flacherie du ver à soie.**—*C. R. Acad. Sci. France*, clxxxiii, no. 17, pp. 704–707. Paris, 1926.

Flacherie in silkworms is due to a number of diseases of the intestinal tract [cf. *R.A.E.*, A, xiv, 559]. In 1924 the author observed silkworms with flacherie symptoms and infected with a sporulating bacillus, which, when inoculated, caused death in 4 or 5 hours at 22° C. [71·6° F.]. In 1925 another species of sporulating micro-organism was observed in silkworms. In the intestinal tract of such larvae numerous bacilli are to be found, the form of which is identical with the vibrios recorded by Pasteur. This organism is less pathogenic than *Streptococcus bombycis*, and appears to multiply actively only if the larva is in a susceptible condition.

POUTIERS (R.). **Observations sur deux insectes vivant aux dépens de *Pieris brassicae*: *Chalcis femorata* Panz., et *Xanthandrus comtus* Harr.**—*Rev. Path. vég. & Ent. agric.*, xiii, no. 1, pp. 31–32. Paris, January–March 1926. [Recd. December 1926.]

Only one individual of *Chalcis femorata*, Panz., was obtained by the author from pupae of *Pieris brassicae*, L., at Mentone in 1923 [cf. *R.A.E.*, A, xii, 233], whereas *Pteromalus puparum*, L., occurred in abundance. A larva of the Syrphid, *Xanthandrus comtus*, Harr., was observed to attack the larvae of *P. brassicae*.

MARIÉ (P.). **Utilisation de la naphthaline pour éloigner les Hannetons femelles au moment de la ponte. Observations diverses.**—*Rev. Path. vég. & Ent. agric.*, xiii, no. 1, pp. 39–48. Paris, January–March 1926. [Recd. December 1926.]

As 1925 was a flight-year of *Melolontha melolontha*, L., in the vicinity of Paris, experiments were started with a view to preventing the adults from ovipositing in particular fields. In this connection various substances were tried, the best results being obtained with crude powdered naphthaline. It should be applied at the beginning of the egg-laying period at the rate of 1 oz. to each  $10\frac{3}{4}$  sq. ft. If it is placed on the soil surface in dry hot weather the repellent odour does not last more than 6 days, but if it is raked into the soil it will continue for 12 days, or over a fortnight if the soil is well watered. Though distinctly repellent to ovipositing females, the naphthaline does not kill the larvae, as was erroneously implied in a recent abstract [*R.A.E.*, A, xiv, 306].

As the flavour of naphthaline is retained by plants for some time, it should not be applied to vegetables that are to be harvested in May.

**Amtliche Pflanzenschutzbestimmungen.** [Official Regulations on Plant Protection.]—*Nachrichtenbl. deutschen Pflanzenschutzdienst*, Beilage no. 8, pp. 133–148. Berlin, 1st November 1926.

The Dutch decree of 26th June 1926 regulating trade in cherries from countries where cherry fly [*Rhagoletis*] occurs, and the Czechoslovakian order of 30th April on the destruction of *Melolontha melolontha* (*vulgaris*) and *M. hippocastani*, are among the legislative measures noticed in this issue.

KOMÁREK (J.). **Vernichtung der Parkettfußböden durch *Lyctus linearis* (*canaliculatus*) Goeze.** [The Destruction of Parquet Floors by *L. linearis*.]—*Anz. Schädlingssk.*, ii, no. 11, pp. 145–148, 5 figs. Berlin, 15th November 1926.

This is the report of a case where floors of oak and ash in newly-built houses in Prague were infested by *Lyctus linearis*, Goeze, to such an extent that they had to be renewed.

It was proved that the flooring had been made of infested timber. This Lyctid is a pest of oaks and has also been recorded from ash, walnut, poplar, willow, and other deciduous trees. It shows a marked preference for the sapwood, and an infestation such as the one under consideration is nearly always due to sapwood being present in the infested material. Conditions indoors are more favourable to the increase of this beetle than those in nature. Painting or impregnating a floor *in situ* with insecticides is of doubtful value; the floor must be taken up and thoroughly impregnated or baked. The larvae live for a year within the wood and finally pupate just beneath the surface. The adults emerge from April to mid-June, cutting through the thin existing layer of wood. The exit-holes are the first indication of infestation.

ANDRES (A.). ***Mesomorphus murinus* (Tenebrion. Col.) ein Rebschädling in Aegypten.** [*M. murinus* a Pest of the Grape-vine in Egypt.]—*Anz. Schädlingssk.*, ii, no. 11, pp. 149–150, 2 figs. Berlin, 15th November 1926.

In 1925 and 1926 vines in Upper Egypt were attacked by a Tenebrionid, *Mesomorphus murinus*, Baudi. The infested vineyard was one

in which the ground was kept damp by the heavy shade of the dense vine foliage. In August the beetles were to be seen in the bunches; many of the latter had fallen to the ground owing to their stems being cut. The beetles were even more numerous on the stocks and on the stakes, where they remain crowded together for weeks. Collection is the measure advised, and experiments are to be made with a bran bait sweetened with molasses and poisoned with calcium or lead arsenate.

ROTHMALER (B.). **Ungewöhnliches Auftreten der Blutlaus.** [An unusual Infestation by the Woolly Aphis.]—*Anz. Schädlingsk.*, ii, no. 11, pp. 150–151, 1 fig. Berlin, 15th November 1926.

A case is reported from Germany in which colonies of the woolly aphid [*Eriosoma lanigerum*, Hausm.] were found inside the fruits of an apple tree.

GASOW (H.). **Forstentomologische Untersuchungen. I.—Ergänzende Feststellungen an *Tortrix viridana* L. II.—Versuche über die Wirksamkeit staubförmiger Chemikalien gegen die Raupe des Kiefernspanners (*Bupalus piniarius* L.).** [Investigations in Forest Entomology. I. Complementary Observations on *T. viridana*. II. Experiments on the Action of Dust Insecticides on the Caterpillar of *B. piniarius*.]—*Arb. biol. Reichsanst. Land- u. Forstw.*, xv, no. 1, pp. 75–78 & 78–98, 15 refs. Berlin, 1926.

The first of these papers gives further notes [*R.A.E.*, A, xiii, 395] on *Tortrix viridana*, L., in Westphalia. Compared with 1923 the months of May and June 1925 had a smaller number of rainy days, a smaller rainfall, and higher average temperatures, and the emergence of the moths occurred about a fortnight earlier—at the end of the first week in June. Of 1,328 pupae, 20.1 per cent. were parasitised, chiefly by *Pimpla maculator*, F. The date of emergence of the parasites was about a week later than that of the moths. It is probable, however, that a disease killed even more individuals than the parasites.

Only preliminary experiments were made in dusting against the pine-moth, *Bupalus piniarius*, L., as it had been checked by parasites. Sodium fluoride, sodium fluosilicate and barium fluoride proved effective, as well as various proprietary arsenical dusts, but it is essential that dusting be done not later than the end of August, when the larvae are still immature.

GASOW (H.). **Versuche zur Bekämpfung des grünen Eichenwicklers (*Tortrix viridana*, L.) mittels eines Motorverstäubers.** [Experiments in combating the Green Oak Tortrix (*T. viridana*) with a Motor Duster.]—*Arb. biol. Reichsanst. Land- u. Forstw.*, xv, no. 1, pp. 99–107, 3 figs., 4 pls., 6 refs. Berlin, 1926.

In continuation of previous work on *Tortrix viridana*, L. [*R.A.E.*, A, xiv, 33], a motor-driven dust-gun, drawn on a sledge by a horse, was used to apply arsenical dusts. The experiments, which gave excellent results in the case of small stands, are described in detail.

BREMER (H.). **Zur Methodik epidemiologischer Untersuchungen im landwirtschaftlichen und gärtnerischen Pflanzenschutz.** [Notes on Methods of epidemiological Investigations in agricultural and horticultural Plant Protection.]—*Nachrichtenbl. deutschen Pflanzenschutzdienst*, vi, no. 11, pp. 87–89. Berlin, November 1926.

Data on the influences of climate on outbreaks of pests of plants have been recorded for several insects in Germany, but they mostly refer to limited periods and areas. Phytopathological institutions should undertake regular, large-scale observations under the direction of a central organisation, which would collate the results. Such work would lead to a considerable advance in the knowledge of the conditions giving rise to an outbreak. Notes are given on methods that have been used in this connection.

SPEYER (W.). **Ueber den Laubfall an Apfelbäumen und das Abfallen unreifer Kirschen im Niederelbischen Obstbaugebiet.** [On the Fall of Apple Leaves and the Fall of unripe Cherries in the Fruit-growing Region on the Lower Elbe.]—*Nachrichtenbl. deutschen Pflanzenschutzdienst*, vi, no. 12, pp. 95–97. Berlin, December 1926.

The fall of apple leaves in summer is due to lack of moisture, and sucking insects may be an important cause of this, *e.g.*, the abundance of *Psylla mali* in 1925 [*R.A.E.*, A, xiv, 110], when serious crop losses resulted.

ZACHER (F.). **Saatbeizmittel als Schutz gegen Kornkäferbefall.** [Seed Disinfectants as a Protection against *Calandra granaria*.]—*Nachrichtenbl. deutschen Pflanzenschutzdienst*, vi, no. 12, p. 97. Berlin, December 1926.

The good results obtained by Mackie against the grain weevil, *Calandra granaria*, L., with copper carbonate dust [*R.A.E.*, A, xiii, 499] have been fully confirmed by similar experiments in Germany.

HERZOG (W.). **Die neuere Entwicklung der Schädlingsbekämpfung mittels Blausäure.** [The recent Development of Pest Control with Hydrocyanic Acid Gas.]—*Chemiker-Ztg.*, 1, p. 493, 1926. (Abstract in *Centralbl. Bakt., Paras., Infekt.*, IIte Abt., lxi, no. 1–7, p. 104. Jena, 5th November 1926.)

In Germany fumigation with hydrocyanic acid gas is effected by means of Zyklon B. This consists of the diatomaceous earth, kieselguhr, impregnated with liquid hydrocyanic acid, of which it is capable of absorbing half its own weight. The polymerisation of the acid thus carried is prevented by the addition of a stabiliser. [*Cf. R.A.E.*, A, xiv, 561, etc.]

GASOW (H.). **Ergebnisse neuerer Untersuchungen über die Bekämpfung des Wiesenwurmes.** [Results of recent Investigations on the Control of Tipulid Larvae.]—*Mitt. Dtsch. Landw.-Ges.*, xli, p. 410 *et seq.*, 1926. (Abstract in *Centralbl. Bakt., Paras., Infekt.*, IIte Abt., lxi, no. 1–7, p. 118. Jena, 5th November 1926.)

In 1924–25 larvae of *Tipula* spp. caused much damage in pasture lands in Westphalia. Watering with a solution of ammonium carbonate

or with liquid ammonia of 2-4 per cent. strength drives the larvae to the surface, where they die; this method is useful as an indicator of infestation. A poison-bait consisting of 50 parts bran wetted with 1 part Paris green in solution is effective in the absence of rain. Excellent results were also obtained with sodium fluoride (1 part to 25-40 of bran) or sodium fluosilicate (1 part to 50), which are less expensive.

[YATZENTKOVSKIĬ] JAZENTKOVSKY (A.). **Injury to the Reproductive Organs of *Myelophilus minor* and *M. piniperda* caused by Nematodes and its Effect on the Viability of the Bark-beetles, Scolytidae. Preliminary Report.** [In Russian.]—*Mém. Inst. Agron. État Bélarussie*, pt. 3, pp. 278-296. Minsk, 1924. (With a Summary in German.) (Abstract in *Centralbl. Bakt., Paras., Infekt., IIte Abt.*, lxi, no. 1-7, pp. 157-158. Jena, 5th November 1926.)

This report gives the results of investigations on the injury caused by Nematodes to the reproductive organs in both sexes of the bark-beetles, *Myelophilus minor*, Hart., and *M. piniperda*, L. The Nematodes occur in the larvae (2-6 per cent.), in the pupae (25 per cent.) and in the adults (25 per cent.). The spread of the Nematodes is probably effected by infested beetles such as are often found dead in the mines.

THIEM (H.). **Die wichtigsten Schildläuse des Obst- und Weinbaues.** 'The most important Coccids injurious to Orchards and Vineyards in Germany.'—*Biol. Reichsanst. Land- u. Forstw.*, Flugbl. 77, 4 pp., 12 figs. Berlin, October 1925. [Recd. November 1926.]

The Coccids dealt with are *Aspidiotus pyri*, Licht., *A. ostreaeformis*, Curt., *Lepidosaphes ulmi*, L., *Lecanium (Eulecanium) corni*, Bch., and *L. (E.) coryli*, L., on fruit trees; and *Pulvinaria vitis*, L., and *Pseudococcus vitis*, Nied., on vines. In each case the life-history and the appropriate measures of control are briefly dealt with.

LUDWIGS (K.) & SCHMIDT (M.). **Korbweidenschädlinge.** [Pests of the Basket Willow.]—*Biol. Reichsanst. Land- u. Forstw.*, Flugbl. 81, 12 pp., 10 figs. Berlin, December 1925. [Recd. November 1926.]

A survey of the more important insect and fungus pests of the basket-willow [*Salix viminalis*] in Germany is given, with a table showing the type of injury caused by each.

The small blue beetles, *Phyllodecta vulgatissima*, L., *P. vitellinae*, L., *P. tibialis*, Suffr., and *Plagioderma versicolor*, Laich.; the small yellow beetles, *Lochmaea capreae*, L., and *Galerucella lineola*, F.; and the large red beetles, *Melasoma saliceti*, Weise, *M. tremulae*, F., and *M. populi*, L., all hibernate in the adult stage, the yellow and the red species under fallen leaves, and the blue species usually at some height above the ground in sheltered positions. In spring they attack the young shoots. The eggs are laid on the undersides of leaves, and these are skeletonised by the larvae. *Plagioderma versicolor* and the red species pupate on the leaves, the others in the ground. There are 2 or 3 generations a year in the blue and red species, and up to 4 in the yellow species. The measures advocated are the burning of the osier-beds in winter, the collection of the adults with suitable devices

[R.A.E., A, x, 584], allowing poultry to run among the willows, dusting with arsenicals, and, if possible, flooding the land when pupation is taking place. All these measures except the last may also be employed against the weevil, *Phyllobius oblongus*, L., which feeds on the young shoots in spring on issuing from hibernation. Its larvae do little harm; they live in the ground, where pupation takes place.

The eggs of *Phalera bucephala*, L., are laid on the upper surfaces of the leaves in May and June, and the larvae hatch in July and feed on the leaves. Pupation occurs in the ground. *Stilpnotia salicis*, L., is a well-known pest, the caterpillars of which abound in May and June. If the larvae have destroyed all the leaves, they then attack the bark of young shoots. Collection and dusting with arsenicals are recommended, and these measures are also applicable to the larvae of sawflies, chiefly *Cimbex* and *Nematus* spp. and *Trichiosoma vitellinae*, L., which can be very harmful by ringing the osiers and rendering them useless. The larvae of the willow-shoot roller, *Earias chlorana*, L., occur in May and June, pupation taking place on leaves or branches from the end of June onwards. The adults emerge during the summer (giving rise to a second generation in September) or may delay emergence until spring. A second generation probably does not occur every year. The rolls should be crushed or the infested tips cut off and destroyed. The bud weevil, *Barypithes araneiformis*, Schr., may attack the buds in spring. It may be combated by the use of poultry, incorporating caustic lime in the soil, or with baits of sliced potato or beet. *Tipula oleracea*, L., *T. pratensis*, L., and *T. maculata*, Mg., attack the young shoots of willows planted in former pasture land, which should be planted with a root-crop before willows are grown.

The more important sucking insects attacking willows are the Cercopids, *Aphrophora salicis*, DeG., and *A. spumaria*, L.; and the Coccids, *Chionaspis salicis*, L., and *Lecanium corni*, Bch. In some years Aphids are troublesome, the principal species being *Pterocomma salicis*, L.

The more important pests forming galls are the gall-midges, *Rhabdophaga rosaria*, Lw., *R. pierrei*, Kieft., and *R. saliciperda*, Duf., *Euura amerinae*, L. (willow-rod sawfly) and *E. saliceti*, Fall. (bud-gall sawfly). All these species may be combated by cutting off and destroying the infested rods and shoots. The sawflies, *Pontania capreae*, L., and *P. viminalis* L., the gall-midge, *Dasyneura marginemtorquens*, Winn., and gall-mites are not of economic importance.

The weevil, *Cryptorrhynchus lapathi*, L., may be a serious pest. Its larvae mine the stems, and the adults gnaw holes in the bark of young shoots, but the chief damage is done to the tips of the willow rods. In May the weevils leave their winter-quarters among fallen leaves, cracks in the bark, etc., and oviposition occurs at the foot of the stock. The larvae hatch towards the end of March in the following year, feed for about three months, and then pupate, the young adults emerging in August. Once this pest is established, all infested stocks must be dug out and burned. Other measures are burning the fields, cutting the osiers as low down as possible, and collection of the adults. Other insects boring in willows are the larvae of the Longicorns, *Lamia textor*, L., *Aromia moschata*, L., *Oberea oculata*, L., and *Saperda carcharias*, L., and of the moths, *Cossus cossus*, L., *Zeuzera pyrina*, L., and *Aegeria (Sesia) formicaeformis*, Esp. These may be checked by the timely removal and burning of all infested stems and rods and by painting particularly valuable stocks with a preparation preventing oviposition.

SPEYER (W.). **Madige Kirschen.** [Maggot-infested Cherries.]—*Biol. Reichsanst. Land- u. Forstw.*, Flugbl. 83, 3 pp., 3 figs. Berlin, October 1926.

The cherry fruit-fly, *Rhagoletis cerasi*, L., infests all kinds of wild and cultivated cherries in Germany, and is also said to infest *Lonicera xylosteum*, *L. tartarica*, and *Berberis vulgaris*. The adults are on the wing from May to June or July, and lay their eggs in the cherries that are just turning red. By the time that the latter have ripened, the maggots have reached maturity and pupate in the ground at a depth of  $\frac{1}{4}$ – $1\frac{1}{4}$  inch. The adults emerge in the following May. This fly requires a warm climate and is therefore almost unknown in the cherry-growing districts on the lower Elbe. In the regions where it occurs the pupae can be destroyed after the harvest by removing the surface of the soil beneath the trees or in places where cherry baskets have stood, and by burying such earth 3 feet deep under an 8-inch layer of trodden clay. Deep cultivation or ploughing is also of value. In large orchards it is best to loosen the surface of the soil in autumn and spring and to keep poultry in them. Nesting boxes should be provided for wild birds. The adult flies may be caught in bait-traps hung in the trees, but a bait-spray, applied a few days before the cherries begin to turn red, seems to be the best method. A suitable spray can be made with 0.2 per cent. sodium arsenate and 3–5 per cent. raw sugar. As there is a risk of scorching the leaves, this spray should be applied very sparingly.

BLUNCK (H.) & LUDEWIG (K.). **Die Fritfliege.**—*Biol. Reichsanst. Land- u. Forstw.*, Flugbl. 9, 4th edn., 4 pp., 1 fig. Berlin, July 1926. [Recd. November 1926.]

Two species of frit-fly occur in Germany, *Oscinella (Oscinis) frit*, L., and *O. pusilla*, Mg. In May the adults fly to their breeding-places, preferably oat fields, and infest these from the edges towards the centre. The males are short-lived, but the females can survive for months, though the majority disappear in June. Each female lays about 70 eggs, which hatch in 3–7 days. After feeding for about 3 weeks the larvae, which do not usually leave the plant on which they have hatched, pupate where they have been feeding, and the adults emerge in 1 or 2 weeks, *i.e.*, from the end of June onwards. The chief flight-period of this brood occurs in the first half of July. Owing to the relative scarcity of young and tender shoots at this season, oviposition on them is crowded and ten or more individuals may be found in a shoot of oats, etc. The larvae pupate in about 2 weeks, and the adults emerge about a week later, most of those of this generation appearing in mid-August. They chiefly oviposit on the leaves of early germinated self-sown grain, but the females can survive until autumn and then oviposit on early-sown winter crops. The resulting larvae hatch within a week; they usually pupate in March or April in the following year, pupation lasting 2 weeks. In very warm years these larvae may yield adults before the autumn, and a fourth generation may result. Warm, dry weather favours the pest, and is disadvantageous to the growth of the plants. The conjunction of an early, dry spring, a hot, dry summer, and a long, mild autumn means a severe infestation, such as occurred in North Germany in 1925, the principal injury being done by the larvae of the spring brood. Direct measures against this pest are as yet unknown,

but the injury can be considerably reduced by methods that decrease the duration of the period when the plants are susceptible to attack and that allow of plants going through the seedling and stem-development stages. These various methods are described. As grass round the fields harbours the fly it should be restricted as much as possible.

WERNECK-WILLINGRAIN (H. L.). **Ein Beitrag zur Fritfliegenplage.** [A Contribution on the Frit Fly Pest.]—*Fortschritte Landw.*, i, no. 22, pp. 705-707. Vienna, 15th November 1926.

Germination tests of oats in Austria showed that only 86-88 per cent. germinated, owing to injury by the frit-fly. Kleine has stated that resistance to attack by *Oscinella frit*, L., is a constant character of certain varieties [*R.A.E.*, A, xiv, 382]; but two species [*O. frit* and *O. pusilla*, Mg.] are involved, and it is not known whether their areas of distribution overlap or are distinct, or whether varieties of oats behave in the same way towards each of them. In Austria the yearly average crop loss due to the fly appears to be 5-20 per cent. Hitherto it has been disregarded, though it is more important than other pests of oats against which measures are regularly directed.

[KIRICHENKO (Alexei).] **Кириченко (Алексей). A Study of the Ecology and Biology of *Calliptamus italicus*, L., in the Steppe Zone of the Ukraine.** [In Russian.]—Odes'ka Kraïova Sil.-Gosp. Dosvidna Stantziya, Ent. Viddil. [*Odessa Reg. Agric. Expt. Sta., Ent. Dept.*], pt. 1, 47 pp., 2 pls. Odessa, 1926.

A detailed study showed that the distribution of *Calliptamus italicus* in the Ukraine is intimately connected with the drier areas in the grass-steppe, occupied by *Artemisia austriaca*. These areas, in which oviposition is concentrated, vary in size, some stretching for several miles, while others are quite small. As the vegetation is less dense, the soil is more exposed to the sun and air. Observations on the food of larvae of *C. italicus*, both in cages and in the field, proved that they show a definite preference for *Artemisia*, *Achillea* and some other plants of the same association, while grasses are seldom eaten, and only when other food is not available. Consequently, the damage to cereal crops occurs only when a swarm of larvae comes accidentally across a field.

The present spread of *C. italicus* in the steppes may, to a great extent, be attributed to the fact that the *Artemisia*-association is replacing the virgin grass-steppe under the influence of over-grazing and other activities of man.

Observations on the emergence of larvae from the eggs showed that the process is spread over a fortnight. This partly depends on minute differences in the environment, but even eggs in the same spot do not all hatch at the same time.

General activity of the larvae begins when the temperature of the air is about 15° C. [59° F.], and the larvae then descend from the plants, where the night has been passed, to the ground, the temperature of which at that time is 4-5° C. [9° F.] higher than that of the air. This indicates that climbing down is due to positive thermotropism, and the further concentration of the larvae on the warmest spots on the ground corroborates this conclusion. A mass movement of larval swarms begins when the temperature on the ground reaches about 30° C.

[86° F.], but if it rises to 37° C. [98·6° F.] the larvae seek shadow and climb the plants. The downward course of the temperature in the afternoon results in the same reactions of the larvae in the reversed order. In the evening, when the swarms stop, the larvae begin to climb on to the plants, though the temperature on the ground is at that time actually higher; it is suggested that this movement is due to positive phototropism, the tops of the plants being under the rays of the sun.

Amongst the natural enemies the rosy starling (*Pastor roseus*) was extremely active and practically exterminated many swarms. A very high percentage of eggs was destroyed by larvae of *Percosia* (*Amara*) *equestris*, Duft. Larvae of *Mylabris variabilis*, Pall., also occurred amongst the eggs, and Bombyliid flies, *Anastoechus nitidulus*, F., have been bred from the egg-pods. No internal parasites of larvae or adults have been found in spite of numerous dissections. An epidemic of *Empusa grylli* developed in June owing to warm and rainy weather and caused the practical extermination of *C. italicus* in the region.

SMRECZYŃSKI, JR. (S.). **O krajowych gatunkach rodzaju *Hypera* Germ. (Col., Curcul.).** [On Polish Species of *Hypera*.]—*Polskie Pismo ent.*, v, pt. 1-2, pp. 1-30, 1 pl., 1 fig., 6 refs. Lemberg, 1926. (With a Summary in German, pp. 26-30.)

A key is given to the species of *Hypera* occurring in Poland, with systematic notes on them.

NUNBERG (M.). **Kilka szczegółów z anatomji podrodzaju *Orthotomicus* Ferrari.** [Notes on the Anatomy of the Subgenus *Orthotomicus*.]—*Polskie Pismo ent.*, v, pt. 1-2, pp. 51-59, 3 pls. Lemberg, 1926. (With a Summary in German, pp. 58-59.)

The anatomy of *Ips* (*Orthotomicus*) *proximus*, Eichh., and *I. (O.) erosus*, Woll., is discussed. As a result of small anatomical and biological differences the author is inclined to treat the former as a variety of the latter [cf. *R.A.E.*, A, xiii, 597].

KARPIŃSKI (J. J.). **Wykaz Korników zebranych w okolicach Kielce od 15/viii. do 15 ix. 1925 r.** [List of Bark-beetles collected in the Environs of Kielce from 15. viii. to 15. ix. 1925.]—*Polskie Pismo ent.*, v, pt. 1-2, pp. 81-83. Lemberg, 1926. (With a Summary in German.)

The 47 bark-beetles collected include *Polygraphus subopacus*, Thoms., on spruce and pine, recorded for the first time from Poland.

KÉLER (S.). **Vorläufige Mitteilung über die an *Anthonomus pomorum* Larven parasitierenden *Pimpla*-Arten.** [Preliminary Information on Species of *Pimpla* parasitising the Larvae of *A. pomorum*.]—*Polskie Pismo ent.*, v, pt. 1-2, pp. 83-86. Lemberg, 1926.

The author has bred the following species of *Pimpla* from larvae of *Anthonomus pomorum*, L.: *P. nucum*, Ratz. (80·6 per cent.), *P. brevicornis*, Grav. (13 per cent.), *P. pomorum*, Ratz. (3·2 per cent.), and *P. brunnea*, Brischke (3·2 per cent.). The identity of *P. brevicornis* is discussed; both it and *P. nucum* may include more than one species. In the case of *P. nucum*, though *A. pomorum* is the principal host on

which the spring generation of the parasite develops, some other host probably serves for the later ones. It has been reared from *Magdalis frontalis*, Gyll., in which case slight morphological differences were noticed in it, which may prove it to be a distinct form that has become adapted to the new host.

Further observations along these lines are necessary.

MOKRZECKI (Z.). **Sur les espèces principales du genre *Eurygaster* (Hem., Heter.), nuisibles au blé.**—*Polskie Pismo ent.*, v, pt. 1-2, pp. 93-104, 2 figs., 5 refs. Lemberg, 1926.

This account of the life-histories of the Pentatomids, *Eurygaster maura*, F., and *E. integriceps*, Put., attacking cereals, is taken from the author's observations in Taurida, the results of which were published in 1894 [cf. *R.A.E.*, A, i, 446-451]. The work of more recent authors in other countries is reviewed. *E. integriceps* is the species recorded in Persia under the popular name of "seyn" [*R.A.E.*, A, xii, 300].

ACHARD (E.). **Le "Souné" dans l'Etat de Syrie en 1925 et 1926.**—*Syrie: Minist. Trav. pub. & Agric.*, 15 & 13 pp. typescript, 3 photographs, 4 figs., 2 blue prints. Damascus, 12th July 1925 & 15th September 1926.

*Eurygaster integriceps*, Puton, has been known in Syria since 1914, but was first noticed as a serious pest in 1924, when an area of about 250 sq. miles was infested. Both barley and wheat are attacked, the latter suffering most, as the barley is harvested before the pest reaches its maximum intensity. The life-history as described from Syria is similar to that in Russia [*R.A.E.*, A, i, 446-448]. It appears that after harvest, or if the insects are exposed to the sun, they enter the soil for shelter, and that they also hibernate in the soil. In fallow land after the harvest they were found at depths from  $2\frac{1}{2}$ -6 in. and as deep as 10 in. in rough ground. In vineyards and fig orchards, individuals (as many as 200 per vine) were found at depths of  $\frac{3}{4}$ -3 $\frac{1}{4}$  in. in the soil shaded by the foliage. In one vineyard they were found during October at a depth of 6 in. The insects do not always remain for hibernation at the same depth as when sheltering from the sun, and as the weather gets cooler they may come up to the surface and shelter under leaves, etc. If these do not afford sufficient protection from the rain, or if the soil allows the water to stagnate, the insects may be drowned.

In 1925 considerable success was obtained by collecting the various stages in hand nets. Collection should begin as soon as the bugs emerge from hibernation, when they are easily caught by hand at the base of the plants, and should be continued until the eggs have been laid, after which there is not much to be gained by collecting until about the middle of May; the work should then continue until after the harvest of the barley at which time the insects migrate to the wheat. If the nets are not properly used, many individuals may be knocked off the plants instead of being captured, and in certain districts this method is replaced by shaking the insects off the plants into a wide mouthed receptacle.

Where possible, in infested districts, the cultivation of wheat should be replaced by that of barley or of leguminous plants.

Control experiments in 1926 showed the importance of destroying all weeds and other suitable shelter plants as soon as the barley harvest is over; this should be continued for several years. Promising results have also been obtained with the cultivation of early maturing varieties of wheat.

Light-traps are of no value against *E. integriceps*. Experiments with diluted sulphuric acid sprays (used in concentrations of 5–10 per cent.) indicated that the death of the insects was due to drowning rather than the action of the acid. Further experiments with other sprays are to be made.

The only natural enemies recorded are an ant, which attacks the adults, and a predacious grasshopper, *Ephippiger* sp., which is uncommon.

[WILKINSON (D. S.).] **Entomology.**—*Cyprus: Ann. Rept. Dir. Agric. 1925*, pp. 15–16. Nicosia, 1926.

Brief notes are given on the insect pests dealt with during the year; in addition to those previously mentioned [*R.A.E.*, A, xiii, 545] they included *Syringopais* (*Nochelodes*) *temperatella*, Led.; *Chrysomphalus* (*Aonidiella*) *aurantii*, Mask., on oranges; and *Trogoderma versicolor*, Creutz., in grain stores. Excellent results have been obtained against the last-named by fumigation with hydrocyanic acid gas.

**Entomological Notes.**—*Rev. Agric. Operations India, 1923–24 & 1924–25*, pp. 59–62 & 63–65. Calcutta, 1925 & 1926.

Most of this information on the noxious and beneficial insects occurring in India during the years under review has already been noticed from more extensive papers by Fletcher, Husain and Susainathan [*R.A.E.*, A, xiii, 10, 221; xiv, 88–90].

A special study was made of the fruit pests of Kashmir during 1923; a spray containing fuel oil, resin and tobacco waste has been found to give promising results against the San José scale [*Aspidiotus perniciosus*, Comst.]. The results of the introduction of parasites for the control of *Nephantis serinopa*, Meyr., on coconuts are encouraging.

KAR (P. C.). **Chillie Leaf Curl Disease.**—*Bengal Agric. Jl.*, vi, no. 3, pp. 118–119. Dacca, September 1926.

Against a mite that attacks chillies [*Capsicum*] in Bengal [apparently identical with that already recorded, *R.A.E.*, A, x, 236], 3 or 4 sprayings with lime-sulphur solution, at intervals of a fortnight, from the time the attack is noticed, have given effective control. The formula recommended for self-boiled lime-sulphur is 8 lb. quick lime and 8 lb. sulphur to 50 gals. water.

BRITAIN (W. H.) & SHAW (W. S.). **Preliminary Report on the Application of Calcium Cyanide Dust to the Control of *Helopeltis* in Tea.**—*Trop. Agriculturist*, lxxvii, no. 4, pp. 209–214. Peradeniya, October 1926.

This paper on experiments against *Helopeltis* [*theivora*, Waterh.] in India has already been noticed from another source [*R.A.E.*, A, xiv, 555].

JEPSON (F. P.). **Tea Termites in Ceylon.**—*Qtrly. Jl. Indian Tea Assoc. Sci. Dept.*, 1926, pt. iii, pp. 134–142. Calcutta, 1926.

The matter contained in this paper has already been noticed [*R.A.E.*, A, xiv, 573].

CORBETT (G. H.) & GATER (B. A. R.). **Miscellaneous Insects of 1925.**—*Malayan Agric. Jl.*, xiv, no. 8, pp. 242–265. Kuala Lumpur, August 1926.

The more important insect pests of the Malay Peninsula in 1925 were dealt with in a previous report [*R.A.E.*, A, xiv, 557]; the present one, compiled in 1926, is supplementary to it and gives brief notes on 70 of the minor pests.

FULMEK (L.). *Physopus ficicola* n. sp. (Thysanoptera).—*Misc. zool. sumatrana*, vii, 4 pp., 1 pl. Medan, 1926.

*Physopus ficicola*, sp. n., is described from the leaf-buds of *Ficus elastica* in Sumatra.

CASTILLO (N.). **Preliminary Studies on the Insecticidal Properties of three Species of Derris in the Philippines.**—*Philipp. Agriculturist*, xv, no. 5, pp. 257–275, 1 fig., 30 refs. Los Baños, October 1926.

Experiments made in the Philippines with aqueous solutions of *Derris polyantha*, *D. philippinensis* and *D. elliptica* have shown *D. polyantha* to be the most effective species against *Aphis medicaginis*, Koch.

Small cowpea plants (*Vigna sinensis*) infested with these Aphids were collected from the field and placed in wide-mouthed bottles, with their roots in water. They were sprayed from a small atomiser with solutions of powdered dried root of *Derris* in varying strengths, a concentration of 4 gms. to 1,000 cc. proving the best. Both lower and higher concentrations were less effective. The effect of *Derris* on Aphids is relatively slow, death ensuing only after the lapse of at least 24 hours; the percentage of Aphids killed is not shown.

CARTON (P.). **Maladies et ennemis de l'Aréquier en Indochine.**—*Bull. écon. Indochine*, xxix, no. 179, pp. 352–356. Hanoi, 1926.

Very few serious pests of the Areca nut palm (*Areca catechu*) are recorded. In Annam, caterpillars sometimes attack the fruits, causing them to drop, a Coccid is found on the leaves in dry seasons, a white grub infests the roots, and the larvae of *Rhynchophorus ferrugineus*, Ol., occasionally construct zig-zag galleries in the trunk. In Tonkin, an unidentified ant causes serious damage by constructing a nest of earth between the base of the petiole and the trunk, the colony living on the opening buds and young inflorescences. A simple method of preventing this nest-building is to make a longitudinal slit nearly an inch deep and 4 in. long down the midrib on the lower surface of the leaf at the base of the petiole where it separates from the sheath, after which a slight pressure will spread the leaf out into a horizontal position. In Cochinchina, *Oryctes nasicornis*, L., as well as *R. ferrugineus* and the above-mentioned Coccid are all more or less injurious.

MAZI (L.). **H. Sauter's Formosa-Ausbeute. Chalcididae (Hym.).** [H. Sauter's Collections in Formosa.]—*Konowia*, v, no. 3, pp. 264–279, 7 figs. Vienna, 20th November 1926.

The Chalcids recorded include *Homalotylus mundus*, Gah., a parasite of *Pseudococcus virgatus*, Ckll., in the Philippines, and a new variety of *Neocladia howardi*, Perk., a parasite of a common Jassid in Hawaii.

OGUMA (K.). **On the Nomenclature of the Alder-Scale.**—*Insecta matsumurana*, i, no. 2, pp. 101–102, 4 refs. Sapporo, October 1926.

*Xylococcus japonicus*, n. n., is suggested for *X. alni*, Oguma nec Florence [*R.A.E.*, A, v, 425; viii, 375].

CORBETT (G.). **Tobacco.—Its Cultivation and Preparation.**—*Dept. Agric. Mauritius*, Gen. Ser., Bull. 33, 30 pp., 11 refs. Port Louis, 1926.

A chapter on insect pests of tobacco in Mauritius is contributed by W. H. Edwards. The nests of *Solenopsis geminata*, F. (red ant), which frequently kills tobacco seedlings, may be destroyed by soaking them with an emulsion prepared as follows:  $\frac{3}{4}$  lb. soap is dissolved in  $\frac{1}{2}$  gal. boiling water, and 1 gal. kerosene is added a little at a time, the emulsion being violently churned all the while until a creamy liquid results,  $\frac{3}{4}$  gal. creoline is then added and well mixed. This emulsion is diluted to 2 per cent. when applied directly to the nest, and to 1 per cent. when used for treating beds containing germinating seedlings.

*Phytometra (Plusia) signata*, F., *P. orichalcea*, F., *Prodenia litura*, F., and *Spodoptera mauritia*, Bois., attack the young plants, while the last two also attack older ones. Seed beds can be freed from the caterpillars by burning and sifting the soil or by soaking it with the 2 per cent. emulsion mentioned above. The nursery should be closed at night, or, if the seeds are sown in the open, a cloth should be spread over the seed beds to prevent the moths from laying eggs among the young seedlings. A poison bait of chopped cactus stems soaked for 24 hours in a 10 per cent. sodium fluoride solution, and placed between the young plants will attract and poison the caterpillars; or the seed beds may be watered with a 1 per cent. dilution of the creoline emulsion. Against crickets, which destroy young plants in the Island of Rodrigues, the following poison bait is recommended:  $\frac{1}{2}$  lb. sugar or treacle mixed with one dessertspoonful of sodium arsenite or Paris green, and sprinkled over 3 lb. bran, green grass or lucerne.

The larvae of *Heliothis (Chloridea) obsoleta*, F., attack the inflorescences and seed pods, and care should be taken to remove these caterpillars before the inflorescences are enclosed in linen bags, if the seeds are to be preserved. The leaves of tobacco in the field are occasionally attacked by the larvae of *Coelonia (Sphinx) solani*, Bois., *Phytometra orichalcea* and *P. chalcytes*, Esp.

*Heterodera radiculicola*, Greef, causes the heaviest loss, and as no practical remedy has yet been found, infested land should not be replanted with tobacco or any other plant that may harbour this Nematode, for a period of four years. The burning of soil used for seed beds will destroy it. Care should be taken only to plant seed from uninfested nurseries.

HALL (W. J.). **Notes on the Aphididae of Egypt.**—*Minist. Agric. Egypt*, Bull. 68, 62 pp., 3 pls., 41 refs. Cairo, 1926.

The object of this paper is to collect and revise the information on the Aphids of Egypt in such a way that it may form a sound basis for future work. Where the original descriptions did not include all forms they have been supplemented so far as possible.

In all, 78 species are dealt with, including *Anuraphis aegyptiaca*, sp. n., on *Rumex* sp.; *Hyadaphis apii*, sp. n., on celery (*Apium graveolens*); and *Rhopalosiphoninus salviae*, sp. n., on *Salvia* sp.

The species recorded for the first time from Egypt are: *Aphis africana*, Theo., on grass, sedge and *Arundo* sp.; *A. compositae*, Theo., on *Solanum nigrum* and *Cestrum pseudoquina*; *Amphorophora cosmopolitana*, Mason (*Rhopalosiphum lactucae*, Kalt.), on *Sonchus oleracea*; *Capitophorus neorosarum*, Theo., on roses; *Macrosiphum jaceae*, L., on *Centaurea cyanus* and *Carthamus* sp.; *M. (Macrosiphoniella) absinthii*, L., on *Artemisia* sp.; *M. (M.) artemisiae*, Boyer, on *Artemisia* and *Achillea*; *Myzus amygdalinus*, Fars., on peach; *M. plantagineus*, Pass., on *Plantago major*; *Idiopterus nephrolepidis*, Davis, on *Nephrolepis davalloides* and *Saintpaulia ionantha*; *Pentalonia nigronervosa*, Coq., on bananas; and *Phloeomyzus passerinii*, Sign., on poplar.

*Pergandeidia tamaricifoliae*, n. n., is suggested for *Aphis tamaricis*, Theo., which may, however, prove to be identical with *A. tamaricis*, Licht.

The synonymy of the following species is dealt with: *Anoecia corni*, L. (*willcocksi*, Theo.); *Anuraphis helichrysi*, Kalt. (*cinerariae*, Theo., *cyani*, Theo.); *Aphis gossypii*, Glov. (*bauhiniae*, Theo., *parvus*, Theo.); *A. pseudobrassicae*, Davis (*mathiolellae*, Theo.); *Capitophorus braggi*, Gillette (*cynariella*, Theo.); and *Myzus persicae*, Sulz. (*Rhopalosiphum lactucellum*, Theo.).

A list of the food-plants of the Aphids occurring in Egypt is appended.

**Notes from the Entomological Laboratory.**—*Rhodesia Agric. Jl.*, xxiii, no. 10, pp. 920–925. Salisbury, October 1926.

As coffee is being cultivated on an increasing scale in many parts of Rhodesia, attention is called to the serious danger of importing seed from Central Africa and other regions that may be infested with *Stephanoderes hampei*, Ferr. (coffee-berry borer), which is indigenous to Uganda and occurs in many other parts of Africa. The importation of coffee seed into Rhodesia is subject to government supervision, and steps are taken to ensure that any seed is certified as free from pests before leaving its country of origin. Nevertheless, a parcel of seed from Uganda has recently been intercepted containing many living individuals, apparently of *S. hampei*. A brief summary of the life-history of this Scolytid is given.

In response to enquiries for treatment of tobacco seed beds against various pests, the methods of fumigation with cyanogas calcium cyanide that have been used with much success in Great Britain and America are briefly described; though these refer chiefly to wireworms, it is hoped that they will be equally effective against such pests as Nematodes, cutworms and Tenebrionids. The methods of using this material include the pre-baiting and live bait methods, and the broadcast method [*R.A.E.*, A, xiii, 627; xiv, 185, etc.].

**A Caterpillar Pest of Sesame.**—*Farming in S. Africa*, i, no. 7, p. 223. Pretoria, October 1926.

The Pyralid, *Antigastra catalaunalis*, Dup., which is a native of South Africa, is recorded as injuring sesame (*Sesamum* sp.) in the Transvaal in April 1926. The caterpillars feed on the tender shoots and leaves in a sort of nest made by webbing the leaves together, and also bore into the green pods of the plant, thus wholly or partly destroying the seeds for which this crop is grown. In one field 30 per cent. of the pods were injured.

In nature pupation probably takes place in the soil. In May the moths emerged in 2–3 weeks, and, though no eggs were found, it is probable that they are laid on the tender parts of the sesame plant. The caterpillars were fairly heavily parasitised by two small Braconids.

**Wattle Bagworm.**—*Farming in S. Africa*, i, no. 7, p. 226. Pretoria, October 1926.

The wattle bagworm [*Acanthopsyche junodi*, Heyl.] can be controlled by favouring the spread of the three contagious epidemic diseases of this bagworm, and the following measures are recommended: Plantations of wattles [*Acacia*] should not be larger than 50 acres, arranged so that the youngest are surrounded by the oldest; the trees should not be stripped before they are at least eight years old, and, when 80 per cent. of the bagworms in heavily infested plantations are dead, some of the brush should be stacked instead of being burnt or a few rows of trees should be left standing in order to disseminate the disease; burning should take place as late as possible; and, when first year plantations are badly infested, the first thinning should be delayed as long as possible.

**A Destructive Potato Beetle.**—*Farming in S. Africa*, i, no. 7, p. 250. Pretoria, October 1926.

The life-history and control of *Epilachna dregei*, Muls., is briefly described [R.A.E., A, iv, 393]. The eggs hatch in 7–11 days according to the temperature, and the pupal stage lasts less than a week.

GUNN (D.). **The Cucurbit Ladybird Beetle** (*Epilachna chrysomelina* F.). —*Jl. Dept. Agric. Union S. Africa*, xii, no. 5, pp. 423–427, 4 figs. Pretoria, September 1926.

Though *Epilachna chrysomelina*, F., has been known in South Africa for some time, it is seldom a serious pest in consecutive years. Both the larvae and adults feed on the leaf tissue of cucurbits until only a skeleton is left. During the summer of 1922–23 this Coccinellid was very prevalent locally in Cape Province, causing considerable injury, particularly to cucumbers and watermelons. The eggs are glued to the fine pubescence of the leaf, in clusters of 8–40 or more, and hatch in 9–11 days. The larval stage lasts from 25 to 37 days, depending on the temperature and food-supply, and the pupal stage from 7 to 9 days. For pupation the larva attaches itself to a leaf or twig. There are two generations a year, the winter being passed in the adult stage. The time of emergence from hibernation depends on climatic conditions; in cold weather egg-laying may be delayed until the end of November. It is advisable to plant early, if possible before the beetles become active.

Other measures recommended are the destruction of wild cucurbits near cultivated ones ; the burial of decayed plants, under which the beetles might hibernate, and the collection of beetles hibernating under rubbish etc. Dusting has not proved satisfactory owing to the nature of the plants attacked and windy weather. Spraying with acid lead arsenate,  $1\frac{1}{4}$  lb. powder to 40 gals. water, or Paris green 1 lb. and lime 2 lb. to 100 gals. water, is most effective and should be done before the young plants are injured, thus probably avoiding the need of a second application. Both sides of the leaves must be sprayed, as the adults almost invariably feed on the upper and the larvae on the lower surfaces.

The only natural enemy observed is the Cape wagtail (*Motacilla capensis*), which feeds on the larvae.

PETTEY (F. W.) & JOUBERT (C. J.). **Report of Studies of Codling-moth at Wellington during the 1925-26 Fruit Season.**—*Jl. Dept. Agric. Union S. Africa*, xii, no. 5, pp. 461-483, 15 tables. Pretoria, September 1926.

Investigations on the codling moth [*Cydia pomonella*, L.] as a pest of apricots in 1925-26 have largely confirmed previous observations [*R.A.E.*, A, xiii, 526]. It is possible that high temperature has less influence on the retardation of development of the insects than was at first supposed. The percentage of larvae hibernating is influenced by the medium in which they or their ancestors have been feeding, thus, of 13 larvae bred on apricots at Wellington, of which the ancestors had been bred on pears at Elsenburg, only 4 hibernated, the rest producing adults during the season, whereas of those of which the ancestors had been bred on apricots at Wellington, only one individual produced an adult the same season, the rest hibernating.

In discussing the remedial measures, the importance of thinning is pointed out, one of the advantages being the greater efficiency of sprays on trees where the fruits are not touching. Growers should concentrate on picking and destroying all infested fruits early enough in October to avoid the possibility of any larvae escaping to hibernate and infest the orchards the following year. Every tree should be inspected once a fortnight, beginning about the middle of October and continuing until the fruit is harvested.

The efficiency of banding depends on the condition of the bark ; on old trees with rough bark, it is almost useless unless the loose bark is thoroughly removed from the branches and trunk, with special attention to the crotches of large branches at the top of the trunk. The removal of the bark tends to concentrate the larvae in the bands, and increases the mortality of those that avoid the bands by exposing them to the heat during the summer. As it is not yet known what effect severe scraping has on the health of the tree, care should be taken to avoid cutting the living bark. The bands should be placed on the trees about the third week in October, just before the earliest larvae leave the fruit. Until the time spent by the larvae under the bands before emerging as adults has been further studied under local conditions, it is recommended that the larvae be removed once a fortnight, beginning at the end of November and continuing until the fruit is harvested.

Spraying experiments indicate that not even a single application of acid lead arsenate powder at the rate of 1 lb. in 40 gals. water with 3 lb. freshly slaked lime can be safely applied to apricots without the risk of severe scorching of leaves and premature defoliation of the

trees. Further tests of neutral lead arsenate must be made before the question of its advisability as a spray can be determined. It is possible that trees growing in deep fertile soil would be less susceptible to spray injury than those growing in less suitable conditions.

PETTEY (F. W.). **The Codling Moth. Measures necessary more effectively to control the Pest.**—*Union S. Africa Dept. Agric.*, Bull. 9, 15 pp., 8 figs. Pretoria, 1926.

The codling moth [*Cydia pomonella*, L.] is undoubtedly the most serious insect pest of pears, apples, quinces and walnuts in South Africa; in Wellington considerable damage is caused to apricots and Kelsey plums. Even in sprayed orchards an average of 20 per cent. of the pears and apples are infested.

The control of the early broods is of the utmost importance. Spraying must be thoroughly and systematically carried out, using not less than 1½ lb. of standard (acid) lead arsenate powder in 40 gals. water or Bordeaux mixture for the first four applications. After 1st January spraying should be avoided, if at all possible, but if it is essential, not more than 1 lb. in 40 gals. can be advised at present. Both African and American investigations indicate that calcium caseinate spreaders have little or no effect on the efficiency of lead arsenate sprays of a concentration that it is practical to apply. Their use after 1st December cannot be recommended until it has been determined that they do not make difficult the removal of spray residue from the fruit by wiping at the time the fruit is harvested. Where spreaders have been used for the past three years growers have had to spray as thoroughly and often as before.

Smith's observations [*R.A.E.*, A, xiv, 488] indicate convincingly that if larvae hatch in large numbers later than midsummer, when the fruit is large, and when the majority of them attempt to enter the sides of the fruit, no amount of spraying and no amount of poison within practical limits can prevent severe infestation. To prevent this late infestation the first spray should be applied to early blossoming varieties as soon as the petals drop; in the case of later varieties, the first spray should be applied when about half the blossoms have dropped their petals and the second when all have fallen. Subsequent sprays, at two week intervals, should be applied to both varieties until 1st December.

Spraying is not by itself considered adequate for controlling the codling moth, and it is of equal importance to prevent future infestation by trapping the larvae emerging from infested fruit by means of boards fixed round the store-room [*R.A.E.*, A, x, 550]. Other essential methods of control have already been noticed [*R.A.E.*, A, xiii, 526].

MUIR (F.). **Notes on some African Derbidae (Homoptera).**—*Ann. & Mag. Nat. Hist.*, (9) xviii, pp. 227–240, 18 figs. London, August 1926.

The species dealt with include the following, described as new from Sierra Leone: *Kamendaka albomaculata* on fern, *Pandanus* sp., guava and oil palm [*Elreis guineënsis*]; *Lydda cocos* on coconut palm; and *L. lineatipes*, *L. hargreavesi*, *Diotrombus nitidus*, *Camma lutea*, and *Paraphenice sierraleonensis*, on oil palm.

HARGREAVES (E.). **Report on the Entomological Section.**—*Sierra Leone: Ann. Rept. Lands & Forests Dept. 1925*, pp. 16–18. Freetown, 1926.

*Cosmopolites sordidus*, Germ. (banana weevil) was found attacking bananas. The larvae of *Papilio demodocus*, Esp., seriously damaged lime, orange and, to some extent, grape-fruit [*Citrus decumana*], by devouring the leaves and often completely defoliating the trees; the larvae of *Cercyonia citri*, Bryant, injured the growing branches of citrus trees by eating the inner tissues and thus killing the distal portion of the twigs. The larvae of the Cossid, *Engyophlebus obesus*, Karsch (*Duonitius armstrongi*, Hmps.), attack cacao by tunnelling into the branches.

Although *Aspidiotus destructor*, Sign. (coconut scale) has invaded new districts, it is controlled by natural enemies where these occur. The distribution of red fungus (*Nectria diploa*), which attacks this scale, has been continued, and there has been a general improvement in the appearance of the coconut palms. In addition, it destroys scale-insects occurring on *Citrus* and other plants. No fungus has been found on scales that attack the fruit of coconut, and since *A. destructor* is often spread without its natural enemies by transport of seed, experiments were made to determine what treatment would kill the scale without detriment to the germinating quality of the seed. Final observations have not yet been made, but it has been found that immersion in pure kerosene has no ill effect. An infested nursery was sprayed with kerosene emulsion in May, and in September most of the seedlings were strong and healthy and few scales remained.

Many cotton plants were severely attacked by a leaf-miner, the larva of the moth, *Acrocercops bifasciata*, Wlsm. *Lasioderma serricorne*, F., and *Araecerus fasciculatus*, DeG., are the most common pests of stored ginger, of which they eat the inner portion of the rhizomes. A weevil, *Balanogastriis kolae*, Desbr., caused serious damage to nuts of kola [*Cola acuminata*], but no further instances of damage by *Parcemydica insperata*, Fst., have been recorded. The Psyllid, *Udamostigma tessmanni*, Aulm., is also a serious and widely distributed pest of kola, especially in nurseries, though the severity of its attack is dependent on the variety; the leaf-sewer, *Sylepta semilugens*, Hmps., is injurious in some districts.

The following species of Derbids have been found on oil palm [*Elaeis guineënsis*]: *Camma lutea*, Muir, *C. dilata*, Westw. [specimens of which have also been received by the Imperial Bureau of Entomology from banana and coconut], *Dioscrombus nitidus*, Muir, *Kamendaka albomaculata*, Muir, *Lydda annetti*, Muir, *L. cocos*, Muir, *L. hargreavesi*, Muir, and *L. lineatipes*, Muir. These insects lower the vitality of the plant by sucking the sap, and fungous diseases may be introduced through the wounds. As the result of charring due to bush burning or other injuries, various beetles are attracted to oil palms, including the large weevil, *Rhina afzelii*, Fhs., which tunnels inside the trunk. No serious damage due to the Hispid beetle, *Coelaenomenodera elaeidis*, Maulik, has been observed.

The locust, *Zonocerus variegatus*, L., which feeds on most crops, defoliated *Citrus* and coconut and other palms, but its attack was checked by an application of Paris green.

*Calandra oryzae*, L., *Silvanus surinamensis*, L., *Tenebroides mauritanicus*, L., and *Sitotroga cerealella*, Ol., attacked various stored products.

PATTERSON (W. H.). **Annual Report of the Government Entomologist.**  
—*Gold Coast: Rept. Agric. Dept. 1925-26*, pp. 36-38. Accra, 1926.

Up to the present, 28 species of termites have been determined from the Gold Coast. Some of those infesting cacao, including *Neotermes aburiensis*, Sjöst., attack it directly from wounds and have no soil connections, while others attack the wounds by means of narrow runways up the stems from the soil. A method of treating the wounds has been described by Ballou [*R.A.E.*, A, ix, 516], but owing to the fact that cacao wounds do not heal quickly in the Gold Coast, periodical retarring of all large wounds is suggested.

The large termites attacking buildings can be destroyed by the fumigation of their nests. Experiments, which were carried out on the nests of *Macrotermes* (*Termes*) *bellicosus*, Smeath., showed that calcium cyanide gave only 50 per cent. control and cannot at present be recommended, but sulphur-arsenic, used in the proportion of one to four, gave satisfactory results. As charcoal used in the furnace was found to clog the discharge nozzle of the fumigator, old palm nuts were substituted. These gave off more smoke, which is useful in locating the surface openings of the nests, and as a much greater heat is also evolved, the powder can be placed in a piece of paper instead of being sprinkled as on charcoal. As this gas has a cumulative effect, the nests should not be opened for ten days after fumigation. Buildings may also be attacked by termites living in small fungal gardens in the soil with openings too minute to make fumigation practicable. These can only be controlled by destroying the nests in the building area and erecting termite-proof buildings [*R.A.E.*, A, xiii, 277, 287].

*Othreis* (*Ophideres*) *fullonica*, L., and *Achaea* spp. caused large patches of decay in ripe bananas, but as bananas for export are packed green, it is not considered that these moths will be prejudicial to the establishment of the industry.

The spraying of coconuts against *Aspidiotus destructor*, Sign., was discontinued owing to the abundance of the predacious Coccinellid, *Chilocorus schiödtei*, Muls. A species of *Erythroneura* causing similar damage was also controlled by natural enemies. *Sahlbergella* spp. are reported on fruits of kola [*Cola acuminata*].

The Halticid beetle, *Cercyonia citri*, Bryant, the adults of which feed on the leaves and buds of *Citrus*, the larvae destroying the young shoots, may be controlled by dusting with calcium arsenate, though this has to be renewed after each rain unless all the plants in a district can be treated at the same time.

Seeds of *Attalea cohune* received from Honduras were heavily infested with the large Bruchid, *Pachymerus nucleorum*, F.

COTTERELL (G. S.). **Annual Report for the Year 1925-26.**—*Gold Coast: Rept. Agric. Dept. 1925-26*, p. 39. Accra, 1926.

Control measures against *Dysdercus* spp. (cotton-stainers) in the Gold Coast should be carried out at the beginning of the season, if it is impracticable to introduce a close season, to destroy such alternative food-plants as silk-cottons [*Eriodendron anfractuosum*, etc.] and baobabs [*Adansonia digitata*], and to regulate the planting of okra [*Hibiscus esculentus*]. As adult cotton-stainers are attracted in immense numbers shortly after the flowering of the cotton, it is suggested that the damage may be effectively reduced by planting a variety of

cotton with short flowering and fruiting seasons and using traps. Late planting may also reduce the percentage of stained cotton as the numbers of stainers decrease considerably after the commencement of the dry season.

Preliminary investigations were made on the usual pests of cacao. A dust containing  $7\frac{1}{2}$  per cent. nicotine sulphate (40 per cent.) was effective against *Sahlbergella singularis*, Hagl., and *S. theobroma*, Dist., where water for spraying is difficult to obtain [cf. *R.A.E.*, A, xiv, 571].

GHESQUIÈRE (J.). **La maladie du Bananier au Congo belge.**—*Bull. agric. Congo belge*, xvi, no. 3-4, pp. 556-560. Brussels, September-December 1925. [Recd. November 1926.]

This paper supplements a previous one [*R.A.E.*, A, xiii, 109], and gives the local distribution of *Cosmopolites sordidus*, Germ., in the Lower Congo, with notes on resistant varieties of banana, the injury done to susceptible plants, and the usual methods of treatment of infested plants and of preventing attack.

**Traitement des arbres fruitiers contre les cochenilles et les parasites de blessures.**—*Bull. agric. Congo belge*, xvi, no. 3-4, pp. 563-565. Brussels, September-December 1925. [Recd. November 1926.]

When Coccids have become established in a fruit plantation, lime-sulphur is the best insecticide, as it is also a fungicide. The method of preparing it is described, with instructions as to the strength to be used on trees during their dormant and growing periods respectively. It has given good results against *Heliothrips rubrocinctus* (cacao thrips), the mealybugs, *Pseudococcus citri* and *P. virgatus*, on fruit trees and ornamental plants and, with the addition of 3 per cent. creoline, against *Sahlbergella singularis* (cacao bug).

Wounds on trees heal very slowly in the Tropics, as there are always a number of insect pests and fungus diseases that attack them and prevent their healing. The usual treatment is with wood-tar (unfortunately, coal-tar is sometimes employed), which, although it checks the action of parasitic agencies, prevents the healing of the wounds. The wounds can be healed and the wood preserved by washing them immediately with a solution of copper bichromate (obtained by mixing solutions of 6 per cent. of potassium or sodium bichromate and of 6 per cent. of copper sulphate, which have been made while hot, and then allowed to grow cold). The action of this substance and its effect on the tree are described.

COCKAYNE (A. H.). **Entomology.**—*New Zealand Dept. Agric., Ann. Rept. 1925-26*, p. 33. Wellington, N.Z., 1926.

The Coccinellid, *Cryptolaemus [montrouzieri]*, is still being reared in large numbers and is now established in several localities. Good results have been obtained with calcium cyanide dust against bronze beetle [*Eucolaspis brunnea*], apple leafhopper [*Typhlocyba australis*], and Aphids, including the woolly aphid [*Eriosoma lanigerum*], but not against red mite [*Bryobia praetiosa*]. Species of *Platygaster* continue to be imported from Europe and bred for the control of the pear midge [*Perrisia pyri*].

QUINN (G.). **Insects attacking Dried Fruits.**—*Jl. Dept. Agric. S. Australia*, xxx, no. 2, pp. 116–118. Adelaide, 15th September 1926.

Dried fruits in South Australia are largely infested by larvae of *Plodia interpunctella* (lesser dried fruit moth) and *Ephestia cautella* (*cahiritella*) (dried fruit moth), which are very much alike and cause very similar damage, and by *Silvanus surinamensis* (saw-toothed grain beetle) and *Tribolium castaneum* (*ferrugineum*). In the temperate climate of Australia, these cosmopolitan pests all breed freely for 7 or 8 months in the year at ordinary room or warehouse temperatures; during the summer they breed freely either indoors or out. Eggs are deposited either on food products or in folds of sacks, crevices in wooden boxes, etc. Dried fruits may become infested on drying greens, though this is more likely to occur in sweat boxes, in packing sheds, in retail shops, and, more particularly, in warehouses. Steps for the suppression of these pests should be begun at the drying green, where no refuse fruit or stones should be left about. Sweat boxes and drying trays should be thoroughly cleaned at the end of the season or during the winter by putting them through a scalding bath before stacking them; sheds should be swept, and crevices in walls brushed out if possible. A steam hose in packing sheds would be an advantage. In warehouses it would be possible to solve the problem by making the store rooms air-tight, so that the usual fumigation methods could be used at intervals to kill successive generations of moths and beetles. The author considers, however, that no gas at present used is capable of killing the eggs unless used in a vacuum, and that any system of fumigation is likely to taint the goods treated, or at least create a suspicion of contamination in the mind of the consumer, and he therefore recommends other measures. Cold storage prevents insects developing in dried fruit, and after storage at 33–36° F. for 9 months, fruit remained for several months uninfested after removal into a room at ordinary temperature where the pests were known to occur. The eggs laid prior to cold storing seemed, therefore, to have lost their vitality. In the author's opinion, heat will eventually be adopted as the medium for treating dried fruit stores and their contents, just as it is used in the United States against *E. kühniella*, though the time required would be longer in a store closely filled with packing cases. He hopes that in time there will be properly designed central bulk stores for dried fruits in each capital city or port, where produce might be stored safely and disinfected from time to time by heating, say, at 150° F. for several hours. Cases have been lined with paper impregnated with a volatile vegetable oil, the odour of which was said to repel or even kill enclosed larvae of the moths, but this substance, although non-poisonous, is apt to impart its flavour to the fruit.

NEWMAN (L. J.). **The San José Scale** (*Aspidiotus perniciosus*).—*Jl. Dept. Agric. W. Australia*, iii, no. 3, pp. 365–371, 1 fig. Perth, September 1926.

*Aspidiotus perniciosus*, Comst. (San José scale) has not assumed the proportions of a serious pest in Western Australia, but, if neglected, has a marked effect on the young wood of infested trees, which it

weakens, as well as scaring the fruit. An account is given of the life-history and habits of this pest, and the usual dormant treatments with lime-sulphur or oil emulsion are recommended.

FOWLER (R.). **Results of some Experiments carried out at the Blackwood Experimental Orchard for the Control of Codlin Moth.**—*Jl. Dept. Agric. S. Australia*, xxx, no. 3, pp. 240–251. Adelaide, 15th October 1926.

Recent attempts to reduce the numbers of the codling moth [*Cydia pomonella*, L.] in South Australia by means of bait traps of fermented apple juice and vinegar [*R.A.E.*, A, xiv, 363] are fully described, and some study has been made of the life-history of the moth as differing from the known history in the United States. The incubation period in Australia has not been determined; the cocoon-spinning and pupal stages are evidently much shorter than in America. The indications are that there are only two definite generations a year, but these overlap to such an extent that all stages may be found at once.

Spraying experiments were made to determine whether the use of spreaders and increased quantities of lead arsenate would give more efficient control. Though the results of only one year's work cannot be taken as by any means conclusive, the indications are that increased strength gives increased efficiency, but that the use of a spreader (calcium caseinate was the one used) gives no direct beneficial results, though it appears to be easier to give the fruit a complete coat of poison if a suitable spreader is included in the spray. The experiments, which are summarised in a series of tables, indicate that a considerable number of larvae managed to escape the poison, although the regulation sprays were carried out at the times recommended, and therefore it appears that some other action is necessary if the moth is to be properly controlled. Shelter bands would be helpful, but unless they are regularly and frequently examined and all the larvae found in them destroyed they are worse than useless.

BROWN (W. H.). **"Dust" Fumigating Citrus Trees.**—*Agric. Gaz. N.S.W.*, xxxvii, pt. 10, pp. 769–777, 5 figs. Sydney, October 1926.

The results of experiments made in a citrus orchard in New South Wales have already been noticed [*R.A.E.*, A, xiv, 332], and the author here gives the owner's general observations on more extensive fumigation with calcium cyanide. Fumigation can be repeated within a short time without damage, and an overdose of the fumigant does less harm than an overdose of spray. The temperature should not exceed 75° F., so that work should be done at night from January to April unless the weather is cloudy. Towards the end of May it should be safe to adopt day fumigation, and the work may be carried on all through the winter until August.

Although it is not advisable to fumigate with potassium or sodium cyanide in periods of drought, trees fumigated with calcium cyanide under such conditions are not unfavourably affected. Fumigation may be carried on with the moisture content of the air as high as 80 per cent., but should be discontinued as soon as the dew falls, or defoliation and possibly a loss of fruit may occur.

If the soil is wet and humidity high, lemon trees should be fumigated by spreading the dust evenly over the soil under the tent, as considerable damage may be done if the cyanide is introduced by a blower in the ordinary way. In this case the dose given should be increased by 50 per cent., and the tent should be left over the tree about an hour instead of the usual 45 minutes.

Trees should not be fumigated in a strong wind, as the gas may be blown to the leeward side of the tent and the scale on the other half of the tree remain unaffected. Precautions should be taken to prevent the tent getting wet, as the damp cloth may pick up soil, which acts like sand-paper, breaking the skin of the fruit and permitting the gas to scorch it.

MUNGOMERY (R. W.) & KELLY (N. L.). **Cane Pests and Diseases.**—*Queensland Agric. Jl.*, xxvi, pt. 3, pp. 213–215. Brisbane, 1st September 1926.

Damage to sugar-cane by *Lepidoderma albobirtum*, Waterh. (grey-back cockchafer) was very severe locally in 1926, mainly on land that had been in cultivation for some years; the injury by the larvae was augmented by the drought, which set in when they were reaching their third, and most injurious, stage. *Rhabdocnemis obscura*, Boisdu., has been injurious in the Proserpine district; the methods of distinguishing the damage done by this pest from that done by the Noctuid, *Phragmatiphila truncata*, Wlk. (sugar-cane moth borer) are described; the measures advised include early harvesting, in order to reduce the number of beetles emerging. A wireworm, *Monocrepidius* sp., was common when the ground was prepared for spring planting in fields that had not been well cultivated and had borne heavy crops of grass and weeds. The larvae of the Eumolpid, *Rhyparida limbaticornis*, Jac., were found in one field at some distance from the nearest she oak tree [*Casuarina*], and it is believed that the adults feed on other plants besides this [cf. *R.A.E.*, A, xiv, 365]. In another district *Opogona glyceiphaga*, Meyr. (sugar-cane bud moth) was widespread and destroyed 50 per cent. of the eyes in one field; in some cases the larvae bored into the stems.

JARVIS (E.). **Notes on a Javanese Digger-wasp.**—*Queensland Agric. Jl.*, xxvi, pt. 3, pp. 215–217, 218–219, 1 pl. Brisbane, 1st September 1926.

The female of the Scoliid, *Triscolia rubiginosa*, F., from Java [*R.A.E.*, A, xiv, 548] did not lay eggs in or paralyse larvae of *Lepidoderma albobirtum*, Waterh., but, in the course of 27 days, laid 16 eggs in larvae of the Dynastid, *Xylotrupes australicus*, Thomp.; only one larva of *T. rubiginosa*, however, completed its development on *X. australicus*, as in most cases the host larvae died before the parasite larvae were half grown. It is thought that larvae of *X. australicus* are more affected by the sting of *T. rubiginosa* than those of *X. gideon*, L., which serve as the host in Java, although they are about the same size; in one instance a larva of *X. australicus* died a few hours after being paralysed. One egg, laid in a larva of *X. gideon*, produced a larva that completed its development and spun a cocoon in 11 days.

JARVIS (E.) & BURNS (A. N.). [Entomological Notes.]—*Queensland Agric. Jl.*, xxvi, pt. 3, pp. 217–218, 219–221, 1 fig. Brisbane, 1st September 1926.

The results of experiments with several soil insecticides for the control of the larvae of *Lepidoderma albohirtum*, Waterh., attacking the roots of sugar-cane are given, expressed as the difference between the percentage infestation on the treated and control plots. Calcium cyanide, in  $\frac{1}{2}$  drachm doses, gave a reduction of 37 per cent., paradichlorobenzene, injected either by hand or by machine, in  $\frac{1}{4}$  oz. doses, 48–49 per cent. reduction, and benzine and a saturated solution of naphthalene in benzene, in 4 drachm doses, 15–17 per cent. reduction. The results, however, cannot be regarded as conclusive, on account of the abnormal weather conditions that prevailed and the irregular distribution of larvae in the plots. In a district where *L. albohirtum* caused serious injury to sugar-cane grown on friable red volcanic soil, in every case the damage was most severe either on the tops of hills or on the slopes of high ridges; such land is particularly suitable for the application of carbon bisulphide or paradichlorobenzene.

Berries of *Lantana camara* infested with larvae of *Agromyza lantanae*, Frogg., have been distributed to one district. In the neighbourhood of Cairns this fly does not prevent the spread of *L. camara*, but probably checks it to some extent. If the eggs are laid in very young berries, the larvae feed in and destroy the seeds, but if they are laid in large green or ripening berries, the larvae feed in the pulp as the seeds are too hard for them to penetrate.

Freshly planted cane sets have been damaged by termites of the genera *Termes* and *Eutermes*, which attack the woody tissue and sprouting eyes; a bait dropped into the planting drills at intervals is advised for controlling them; this may be prepared by adding 10–15 lb. molasses to 2 quarts water containing 1 lb. arsenious oxide (white arsenic) and then stirring in 35 lb. megass.

MUNGOMERY (R. W.). **Report of the Southern Assistant Entomologist.**—*Queensland Agric. Jl.*, xxvi, pt. 4, p. 283. Brisbane, 1st October 1926.

In September the author found larvae of *P[hragmatiphila] truncata*, Wlk. (sugar-cane moth borer) injuring the tops of sugar-cane sticks, in which they had hibernated; in the autumn the larvae of the previous generation, which pupated in March, had attacked the bases of the same canes. It is therefore evident that some of the moths that appear in the autumn do not fly far, but lay eggs in the canes from which they emerge. In August, when winter was at its height and slight frosts occurred, second and young third stage larvae of *P[seudoholophylla] furfuracea*, Burm., were found feeding on cane roots near the surface, while older third stage larvae, probably a year in advance of the others, were in pupal cells at depths of 15 to 21 inches. It appears, therefore, that larvae of *P. furfuracea* in Southern Queensland do not hibernate, as do the cane grubs [*Lepidoderma albohirtum*, Waterh.] of Northern Queensland. The second stage larvae were, however, at depths of 2 to 15 inches, so that soil fumigation during the winter cannot be advised for controlling this pest.

JARVIS (E.). **Cane Pest Combat and Control. Entomological Hints to Canegrowers.**—*Queensland Agric. Jl.*, xxvi, pt. 4, pp. 284–286. Brisbane, 1st October 1926.

The Tineid, *Ephysteris chersaea*, Meyr., has been found attacking sugar-cane in a district far removed from that in which it first occurred [*R.A.E.*, A, ix, 371; xiii, 172]. The larvae are usually confined to second and third ratoon shoots from 7 to 9 inches high; they have not yet been recorded from plant cane, but instances of shoots 18 inches high being attacked have been observed. The larvae of Tenebrionids of the genera *Gonocephalum* and *Opatrum* are minor pests of cane roots, and the life-history of *G. carpentariae*, Blackb., is being studied. The Melolonthid previously recorded as *Lepidiota grata*, Blackb. [*R.A.E.*, A, xiii, 115, etc.] is not that species, and remains unidentified; another species that is a minor pest of sugar-cane in North Queensland has been identified by Mr. G. J. Arrow as *L. grata*.

Larvae of the grey-back cane beetle [*Lepidoderma albohirtum*, Waterh.] pupated at the end of June in 1926, at an average depth of 14 inches, this being 2 inches deeper than usual, as the soil was drier, and on 21st August pupae and adults were present in the pupal cells in about equal numbers, suggesting the possibility of an early emergence. The years in which the adults emerge in October or early November, as occurred in 1917 and 1918, are particularly favourable for the control of the larvae by soil fumigation, as much of the cane is still small, and the period during which the soil is sufficiently dry is longer. If there is a dry spell after pupation, lasting throughout November and December, many of the beetles never emerge, but die in the pupal cells; in 1925 the rainfall during October, November and December was 6.09 inches, being 9.18 inches below the normal, and *L. albohirtum* received a considerable check.

**Bunchy Top—Departmental Action.**—*Queensland Agric. Jl.*, xxvi, pt. 4, pp. 297–298. Brisbane, 1st October 1926.

This is a brief account of the measures that have been taken and an outline of the action that it is proposed to take in order to carry out the recommendations of the Bunchy Top Investigation Committee [*R.A.E.*, A, xiv, 95]. To prevent any further spread of bunchy top disease by means of infected plants the transfer of banana plants within the State was absolutely prohibited by a proclamation issued on 28th April 1926. So far, in Queensland, the disease has only been found in the south, with the exception of an isolated outbreak in the north, the origin of which has been traced to the importation of infected plants from the southern part of the State, and which is now well under control. If no further outbreaks of the disease are discovered, the transportation of banana plants in and from certain areas will be allowed, provided that they are certified free from disease.

**[Prickly-pear Control.]**—*Queensland Prickly-pear Land Commiss.*, 2nd Ann. Rept., 1925–26, pp. 20–23. Brisbane, 1926.

The biological control of prickly-pear [*Opuntia* spp.] in Queensland, where it covers some 10,500,000 acres, is being continued with success [*R.A.E.*, A, xiii, 558]. Where the growth of the pear is only light, or on land that is required to be worked for agricultural purposes, this

method is not advocated, as on such areas it will pay to use poisons, but on large tracts of grazing land, which is never likely to be very valuable, and where there is dense growth of pear, the cochineal insect, *Dactylopius tomentosus*, is proving of great value. During the past 21 months, 17,000 cases of these insects have been distributed by the Commission, the progeny from a few individuals being capable of spreading over several thousand acres of pear-infested land, and ultimately causing even the biggest and toughest plants to wither and die down to the roots. After three or four years' work, large areas of dense pear growth have been entirely broken down by this means. In Australia, only one local insect enemy of the cochineal insect has been observed; this is the Coccinellid, *Cryptolaemus montrouzieri*, but the present indications are that it is not seriously hampering the spread of the Coccid. A large consignment of the cochineal insect has also been sent to New South Wales for distribution in that State. It has been proved that the insects live on *Opuntia* spp. exclusively; all efforts to induce them to live on economic plants have been unsuccessful, and if no prickly-pear is available, they die out.

ESCHERICH (K.). **Brasilianische Skizzen. 2. Die Blattschneiderameise und andere Forstschädlinge. 3. Musterbeispiel einer erfolgreichen Schädlingbekämpfung.** [Brazilian Sketches. 2. The Leaf-cutting Ant and other Forest Pests. 3. A Model Example of a successful Campaign against an Insect Pest.]—*Forstwiss. Centrallbl.*, 1926, no. 17, pp. 593-613, 11 figs.; no. 18, pp. 645-652, 4 figs. Berlin, 1926.

These papers are a review of recent work on noxious insects in Brazil, those dealt with being *Atta sexdens*, L., termites, a Lamiid beetle, *Oncideres* sp., and the coffee-berry borer, *Stephanoderes hampei*, Ferr. (*coffea*, Hag.).

As a result of recent work on the last-named pest, a definite plan of campaign has been organised. The measures adopted include: Prevention of breeding by removing all berries on the ground and those remaining on the plants and burning them or burying them at a depth of about 20 inches; fumigation of all harvested fruit with carbon bisulphide before drying so as to destroy the adults; examination of all workmen coming from other plantations, for the presence of coffee fruit; disinfection of all sacks to prevent reimportation; the destruction of all old neglected plantations, and of any trees with rough bark or hollows that might harbour infested fruit; the burning of all refuse from machinery, etc.; and the passing of legislation to prevent the transportation of living coffee plants, branches with fruit, etc.

As a result of these measures, the infestation is stated to have been reduced from 90-100 per cent. in 1924 to 1-5 per cent. in 1925 and 1926.

WILLE (J.). **Sobre um insecto nocivo aos pomares.** [An Insect injurious to Orchards.]—*Egatea*, xi, no. 5, pp. 344-347, 5 figs. Porto Alegre, September-October 1926.

In the Brazilian State of Rio Grande do Sul a Curculionid, *Naupactus* sp., is a pest of fruit and ornamental trees, of which it attacks the buds, the bark of the branches, and the leaves. The adult weevils occur throughout the year except from June to August. The eggs are laid

in heaps of about 200 in the ground beneath the trees, and the larvae live in the roots of these trees and in those of other plants, without doing any noticeable harm. Pupation takes place in the soil. There appear to be two generations a year. The measures advised are the collection of the weevils, or spraying once a fortnight with lead arsenate.

HUME (H. H.). **The Cultivation of Citrus Fruits.**—Svo, xxi+561 pp., 237 figs., 40 refs. London, Macmillan & Co., Ltd., 1926. Price 21s.

Some 82 pages of this book are devoted to insects in relation to the cultivation of *Citrus* fruits in the United States.

Methods of spraying, dusting and fumigating are described, and spray schedules and formulae for insecticides given, with particulars of the fungus diseases of scale-insects and the predacious and parasitic enemies of *Citrus* pests.

HUTCHINGS (C. B.) & HUDSON (H. F.). **Report of Insects of the Year 1925.**—56th Ann. Rept. Ent. Soc. Ontario, 1925, pp. 7-8 & 11-12. Toronto, 1926.

Insect pests in the Ottawa district included *Hylemyia antiqua*, Mg. (onion maggot), which was very plentiful, causing losses ranging from 25 to 60 per cent. of the onion crop; *Psila rosae*, F. (carrot rust fly), which was again very injurious; *Poecilocapsus lineatus*, F., in flower gardens; *Lema trilineata*, Ol., on potatoes; *Xylina* (*Graptolitha*) *antennata*, Wlk. (green fruit-worm), on many trees and shrubs; *Basilona imperialis*, Drury, in small numbers on white pine [*Pinus strobus*]; *Gracilaria cuculipennella*, Hb. (privet leaf-miner), on *Ligustrum amurense*; and *Neodiprion lecontei*, Fitch (pine sawfly), which did considerable damage to young red and Austrian pines [*Pinus resinosa* and *P. laricio austriaca*].

In south-western Ontario the more unusual insect pests were *Alypia octomaculata*, F. (eight-spotted forester), the larvae, which were heavily parasitised by a Tachinid, being abundant on grape-vines in one locality; *Depressaria heracleana*, DeG. (parsnip webworm), unusually abundant, especially on cow-parsnip [*Heracleum*]; *Papaipema cata-phracta*, Grote (potato stalk-borer), bred from potato stalks; *Datana ministra*, Drury (walnut caterpillar), less abundant than in the previous year; and *Lachnosterna* (*Phyllophaga*) *rugosa*, Melsh., a small flight of which occurred in early June.

CAESAR (L.) & ROSS (W. A.). **Insects of the Season in Ontario.**—56th Ann. Rept. Ent. Soc. Ontario, 1925, pp. 13-17. Toronto, 1926.

Many of the insects recorded in this paper are the same as those in recent years [R.A.E., A, xi, 499; xii, 537; xiii, 585]. *Empoasca fabae*, Harr. (apple leafhopper) was unusually abundant on apples, and also occurred on plums, walnuts and raspberries in the Niagara district; it causes severe curling of young leaves but does not produce mottling. *Typhlocyba rosae*, L. (rose leafhopper) was abundant on apples in the Niagara district; it produces mottling on the leaves but no distortion. *Hyphantria cunea*, Drury (fall webworm) was common on apples in some districts, but did little damage in well-kept orchards. Peaches were again attacked by *Lygus quercalbae*, Knight, *L. omnivagus*, Knight, and *L. caryae*, Knight, but although fruit within

40 yards of oak and hickory trees was severely damaged, the Capsids did not occur much more than 100 yards from them. Other peach pests were *Lygus pratensis*, L. (tarnished plant-bug), which was very injurious to young trees; *Myzus persicae*, Sulz., which appeared in considerable numbers in late May, but caused little damage, as it does not remain long on peach; a twig borer, believed to be *Anarsia lineatella*, Zell.; and *Cydia* (*Laspeyresia*) *molesta*, Busck. *Lecanium corni*, Bch., was unusually prevalent on plums; and *Aphis illinoisensis*, Shimer (brown grape aphid), and, in one locality, *Oxyptilus periscelidactylus*, Fitch (grape plume moth) were exceptionally numerous on grape-vines. During the winter, eggs of *Paratetranychus pilosus*, C. & F. (European red mite) were very abundant on plum, apple and peach trees, but there was no early outbreak of the mite, and it caused no appreciable damage until August; raspberries were severely attacked by *Tetranychus telarius*, L., in June, but serious reduction in the crop was largely prevented by the frequent rains that fell in July.

Pests of vegetables included *Diabrotica duodecimpunctata*, Ol., on cucumbers, *Papaipema cataphracta*, Grt., *Lycophotia* (*Peridroma*) *margaritosa*, Haw. (variegated cutworm), and *Agrotis* (*Noctua*) *fennica*, Tausch. (black army cutworm); *A. fennica* also did considerable damage to lucerne and sweet clover [*Melilotus*]. *Symmerista albifrons* S. & A. (red-humped maple worm) defoliated maples in one district. *Tyroglyphus farinae*, L., occurred in very large numbers in grain intended for poultry; paradichlorobenzene or carbon bisulphide quickly killed the mites, and 5 per cent. carbolic acid also killed them, but much more slowly, while hydrated lime and sodium fluoride were ineffective. *Gryllus domesticus*, L. (house cricket) has been troublesome in kitchens and bakeries in Toronto. A large flight of *Hypera punctata*, F. (clover weevil) is recorded.

Ross (W. A.). **Notes on the Control of the Grape Berry Moth.**—56th Ann. Rept. Ent. Soc. Ontario, 1925, pp. 17-19. Toronto, 1926.

The grape-berry moth [*Polychrosis viteana*, Clem.] has been a serious pest in vineyards in a few localities in Ontario in the last few years; the life-history is briefly described [cf. R.A.E., A, iv, 190]. Owing to the heavy mortality of the pupae during the winter in Ontario, the larvae of the first brood are usually not sufficiently numerous to cause much damage. Experiments were made in 1924 with sprays of 1½ lb. lead arsenate in 40 gals. Bordeaux mixture, with the addition of either 2 pints Sunoco oil or 1 lb. soap. The sprays were applied immediately after flowering, and in some cases were repeated 2 or 3 weeks later. All the treatments were very successful, less than 1 per cent. of the berries and less than 11 per cent. of the bunches being infested on the plot sprayed twice with lead arsenate, oil and Bordeaux mixture at an interval of two weeks, and on both the plots sprayed with lead arsenate, soap and Bordeaux mixture, while on none of the sprayed plots were more than 2 per cent. of the berries and 20 per cent. of the bunches infested, as compared with 47 per cent. of the berries and 99 per cent. of the bunches on the unsprayed plot. In 1925 the whole vineyard was sprayed with lead arsenate, soap and Bordeaux mixture shortly after flowering, and the unsprayed rows of the previous year were sprayed again two weeks later; on the previously unsprayed rows 3 per cent. of the berries and 24 per cent. of the bunches were infested, on the rest 0.4 per cent. of the berries and 4 per cent. of the

bunches. Thorough spraying with lead arsenate, soap and Bordeaux mixture immediately after flowering, and again two weeks later if the infestation is severe, is therefore recommended.

DOWNES (W.). **The Rose Scale in British Columbia.**—56th Ann. Rept. Ent. Soc. Ontario, 1925, pp. 19-22. Toronto, 1926.

*Aulacaspis rosae*, L. (rose scale) has recently become a serious pest of raspberries, blackberries and, to a less extent, of loganberries, over a small area in the Fraser Valley, British Columbia, after being present for some years without causing appreciable damage. On canes that are heavily attacked, the leaves are stunted and the yield is greatly reduced; on blackberries even a moderate infestation ruins the crop. The scale has not been found on wild blackberries and raspberries in the locality.

The winter may be passed in any stage, but in British Columbia the winter mortality is high in some years, and in the spring of 1925 no eggs were found that had survived the winter. In sheltered places 80 per cent. of the females were alive, most of them being individuals that had reached maturity just before hibernation. Oviposition begins in late April or early May, each female laying 30 to 50 eggs that hatch in about a month; a second batch of eggs is laid soon after the hatching of the first and these hatch early in July. The over-wintered females begin to die in July, a few remaining alive until August, by which time the first spring brood has reached maturity; the females of this brood begin to lay eggs early in August, and by September the young canes are heavily infested with scales of various ages. In October oviposition ceases, and the females begin to go into hibernation. The young larvae are active, but frequently settle down close to the old scales unless the cane is old and heavily infested, in which case they migrate to new growths. There is no distinct scale formation until after the second moult in the females and the first in the males, but there is a slight exudation of wax from the time of hatching. The larvae become mature after about two months. The life of the adult males is very short, as they have no functional mouth-parts, but the females may live for eleven months. The proportion of males and females varies greatly; sometimes very few males may be present, while in late summer 90 per cent. of the adults may be males. Canes are infested mainly within 12-18 inches of the ground; a few scales have been observed on the petioles of the leaves.

Dormoil, kerosene emulsion, and lime-sulphur sprays applied during March gave only partial control of the adults and apparently did not affect the eggs. In August further tests were made with the following sprays: 1 lb. fish-oil soap to 1 gal. water;  $\frac{1}{2}$  lb. fish-oil soap to 1 gal. water, applied warm;  $\frac{1}{2}$  lb. fish-oil soap and  $\frac{3}{4}$  oz. 40 per cent. nicotine sulphate to 1 gal. water;  $\frac{1}{2}$  lb. fish-oil soap and 2 oz. Ialine (a cresol-soap spray) to 1 gal. All these applied after the old fruiting canes had been removed, at about 2 gals. to 30 feet of row, gave over 90 per cent. control, killing both adults and eggs. In a further test at the end of September all four sprays gave almost complete control, although heavy rain fell immediately after they had been applied. Fish-oil soap, miscible oil, and lime-sulphur sprays applied in the following spring were again only moderately successful. Cutting out and burning the fruiting canes as soon as possible after the fruit has been

picked, and spraying with 1 lb. fish-oil soap in cold water or  $\frac{1}{2}$  lb. in hot water, are recommended ; a driving spray should be used, and the canes should be thoroughly wetted.

GIBSON (A.). **The Oriental Peach Moth in Canada.**—56th Ann. Rept. Ent. Soc. Ontario, 1925, pp. 22–24, 3 refs. Toronto, 1926.

In the latter half of September 1925, the author found larvae of *Cydia* (*Laspeyresia*) *molesta*, Busck (oriental peach moth) in peaches in the Niagara district of Ontario ; a few days later adults were taken in orchard bait pans. A rough survey of the district showed that this pest is present in at least four localities, from which it is concluded that it was probably introduced several years previously. Since 1916, when it was described from the District of Columbia [R.A.E., A, v, 75], *C. molesta* has spread in the United States to all the Atlantic States from Connecticut to Florida and also to several middle-western States. Descriptions of the stages and a summary of the life-history are given.

KELSALL (A.), SPITTALL (J. P.), GORHAM (R. P.) & WALKER (G. P.). **Derris as an Insecticide.**—56th Ann. Rept. Ent. Soc. Ontario, 1925, pp. 24–40. Toronto, 1926.

A short account is given of the nature and chemical properties of the insecticide prepared from the roots of *Derris* (*Deguelia*) *elliptica* and *D. uliginosa* [cf. R.A.E., A, xi, 248 ; xiv, 41]. Taken by the mouth derris is apparently not poisonous to man and the higher animals, probably because, being insoluble in weak acids or alkalis, it passes through the digestive system unchanged, and is only toxic when it reaches the blood stream ; it can therefore be applied safely on food such as cabbages and currants, shortly before use. It is usually considered to be both a stomach and a contact poison for insects, but the authors are of the opinion that it is only a contact poison, although many groups of insects normally controlled by stomach poisons are killed by it. As a general rule, death is much more rapid when the insects themselves are sprayed than when they are placed on foliage that has been sprayed. Insects placed on sprayed foliage tend to feed very little, and have been noticed to become paralysed and die without feeding at all ; insects fed with a bait containing derris, coming little into contact with the bait externally, have not been seriously affected. It is therefore concluded that derris is insoluble in the digestive juices of insects, and as with higher animals, has to enter the blood to be toxic ; entrance to the blood is presumably obtained through the spiracles.

In field tests against larvae of *Leptinotarsa decemlineata*, Say (Colorado potato beetle) 1 lb. derris in 40 gals. Bordeaux mixture (4–4–40) gave 90 per cent. control in 24 hours, while approximately 50 per cent. of the larvae sprayed with 1 lb. calcium arsenate in 40 gals. Bordeaux mixture went on feeding for 36 hours, indicating that the action of derris is much more rapid than that of calcium arsenate, an important consideration in the case of severe infestations. In laboratory tests in which larvae were placed on potato leaves sprayed and allowed to dry, derris was found to be very highly toxic,  $\frac{1}{8}$  lb. in 40 gals. Bordeaux mixture or hydrated lime solution giving complete control ; the action was more rapid with larger proportions, and was

slower in Bordeaux mixture than in hydrated lime solution. In subsequent field tests  $\frac{1}{2}$  lb. derris in 40 gals. Bordeaux mixture or hydrated lime solution gave 95 per cent. control, while all larger amounts gave complete control. The results of laboratory tests of derris in dusts were rather irregular, but showed that its toxicity was reduced by mixing it with hydrated lime and still more by Bordeaux dust. In field dusting experiments 3 per cent. derris and 97 per cent. hydrated lime or 4 per cent. derris and 96 per cent. Bordeaux dust gave complete control. Considered from the number of larvae of *L. decemlineata* eventually killed, 1 lb. derris is equivalent to from  $1\frac{1}{2}$  to 3 lb. calcium arsenate.

Larvae of *Malacosoma americana*, F. (orchard tent caterpillar) placed on leaves treated with 5 lb. derris to 100 gals. water were nearly all stupefied in one day and dead in three days, although hardly any feeding took place and the poison must have acted by contact; with 10 lb. derris to 100 gals. all larvae were paralysed after one day and dead after three days. Under absolutely dry conditions dusting larvae and leaves with derris and hydrated lime gave 60 per cent. control in 7 days with 8 per cent. derris, and 70 per cent. control in 3 days and 100 per cent. in 6 days with 20 per cent. derris. Moisture was subsequently found to increase the efficiency of derris greatly. In a series of spraying experiments derris was found to be much more toxic to larvae of *M. americana* when applied to larvae and foliage than when applied to foliage alone; when applied to larvae and foliage 1 lb. derris in 100 gals. water was as effective as 2 lb. lead arsenate and much quicker in action, but applied to leaves alone lead arsenate, 2 lb. to 100 gals., was more effective than the same amount of derris. Derris was much more effective than nicotine sulphate at practical strengths.

Larvae of *Pteronous ribesii*, Scop., all died in 3 hours after being placed on foliage dipped in water containing  $\frac{1}{2}$  lb. derris to 100 gals., while lead arsenate, 2 and 5 lb. to 100 gals., was much slower in action. On currants sprayed with derris at strengths from 5 to 0.31 lb. to 100 gals. water all larvae of this sawfly were killed in 2 days, the effect of the higher strengths being very rapid. Dusting with derris, 10 to 1.25 per cent., and hydrated lime gave 100 per cent. control on all plots, while a 2 per cent. nicotine dust gave only about 80 per cent. control.

In sprays against *Aphis pomi*, DeG. (green apple aphids)  $2\frac{1}{2}$  lb. derris in 100 gals. water, with soap, gave complete control, but without soap it was less effective at twice that strength; 40 per cent. nicotine sulphate, 1 : 800, gave about 95 per cent. control with or without soap. As a dust, 10 per cent. derris, with hydrated lime, was much less effective than 40 per cent. nicotine sulphate at 5 per cent., possibly because of lack of moisture. In laboratory tests with *Macrosiphum solanifolii*, Ashm. (potato aphids)  $\frac{1}{2}$  pint 40 per cent. nicotine sulphate to 100 gals. water was as effective as 5 lb. derris, both giving complete control; as a dust,  $2\frac{1}{2}$  per cent. derris, with hydrated lime, gave complete control in 5 days on wetted foliage, being less effective at 10 per cent. on dry foliage. In a laboratory experiment with *Aphis rumicis*, L., 5 lb. derris in 100 gals. water gave only 40 per cent. control in the same time that  $\frac{1}{2}$  pint 30 per cent. nicotine sulphate to 100 gals. gave 90 per cent. control, but two days later all the Aphids reared with derris were dead. Aphids sprayed with derris may apparently remain paralysed and motionless on foliage for several days without shrivelling.

For the control of *P[ieris] rapae*, L., on cabbages derris was more effective as a spray than as a dust;  $2\frac{1}{2}$  lb. derris in 100 gals. water with 3 pints Sunoco oil gave 90 per cent. control when the growth of both the cabbages and larvae was advanced.

Undiluted derris dust gave complete control of larvae of the larch sawfly [*Lygaeonematus erichsoni*, Htg.], and a derris and hydrated lime dust (50 : 50) controlled the three-lined potato beetle [*Lema trilineata*, Ol.], but was ineffective against the squash bug [*Anasa tristis*, DeG.], and, possibly because of lack of moisture, against the currant aphid [*Myzus ribis*, L.]. Spraying with  $1\frac{1}{2}$  lb. derris in 100 gals. water, with a little soap, freed a birch tree from Aphids in two days. Both sprays and dusts gave some control over the larch case-bearer [*Coleophora laricella*, Hb.], but were almost or entirely ineffective against *Hyphantria cunea*, Drury (fall web-worm) and the chain-dotted Geometrid [*Cingilia catenaria*, Drury], against which arsenicals were also almost valueless. Derris was also ineffective as a spray against *Eucosma* (*Spilonota*) *ocellana*, Schiff. (bud-moth), as a dust against *Chermes*, and in baits for cutworms. A trunk of woollen goods swarming with clothes moths was given a liberal application of derris and hydrated lime dust (50 : 50), and after 4 days all the moths were dead; a month later no moths or living larvae were found.

Ross (W. A.). **Miscellaneous Notes on Lubricating Oil Sprays with Special Reference to their Use for Pear Psylla Control.**—56th Ann. Rept. Ent. Soc. Ontario, 1925, pp. 40-44. Toronto, 1926.

In the autumn of 1923 an investigation of lubricating oil sprays, primarily for the control of the pear psylla [*Psylla pyricola*, Först.] was begun in Ontario, Sterling Red Paraffin Oil, the properties of which are given, being the oil used [*R.A.E.*, A, xiii, 584]. Various emulsifiers and methods of emulsification were tested, and soap emulsions were found troublesome to prepare, requiring a boiling outfit, and showed no superiority over cold emulsions. Emulsions made with copper sulphate and lime, calcium caseinate, albumen or milk are easily prepared, mix readily in hard water, and make a smooth and uniform spray mixture; they are not, however, very stable, and it is advisable to prepare them as needed. The method of emulsifying is described; if a stock emulsion breaks down before use, it can be re-emulsified, but if the emulsion breaks down after dilution, the spray cannot be used.

In 1925 extensive experiments with lubricating oil emulsions for the control of *P. pyricola* were made with the formula that was most successful in 1924 [*loc. cit.*], also with 6 oz. calcium caseinate or albumen,  $2\frac{1}{2}$  pints skim milk, or soap as emulsifiers in place of copper sulphate and hydrated lime, and with a 4 per cent. Bordeaux oil emulsion, being the same formula with 4 instead of 3 gallons of oil. The sprays were applied in the spring after the adults had come out of hibernation and had begun to oviposit. Remarkably good control was obtained, the trees remaining almost free from injury throughout the summer. The different emulsifiers gave equally good results, and there was no evidence of the 4 per cent. spray being superior to the 3 per cent. The reason for the success of a single application of oil is not entirely understood, as it is doubtful whether the destruction of adults by wetting would account for it alone; it is possible that the oil film on the bark destroys adults and nymphs. It is probable that, in some seasons and under certain conditions, the oil spray will

have to be supplemented with a later application of nicotine, but it is much more effective and much cheaper than any remedy previously tested.

Lubricating oil sprays have been used successfully against a large number of insects; in Ontario a 3 per cent. spray has been as effective as lime-sulphur and nicotine for the control of the black cherry aphid [*Myzus cerasi*, F.]. There is a possibility that the cumulative effect of lubricating oil sprays on trees may be injurious, but the author knows of no instance in which 2-4 per cent. dormant or delayed dormant sprays, properly applied, have caused injury to deciduous trees, nor has he observed any instance of 2-3 per cent. sprays retarding bud development on healthy trees, although they may retard the development of pear wood seriously weakened by *P. pyricola* or low temperatures.

FELT (E. P.). **The Distribution of Insects and the Significance of Extralimital Data.**—56th Ann. Rept. Ent. Soc. Ontario, 1925, pp. 44-47, 1 ref. Toronto, 1926.

The author first discusses the different meanings of the term distribution as applied to insects, and emphasises the desirability of attaching a more definite significance to it and of indicating in faunistic works whether the species recorded breed in the particular region, either continuously or at certain seasons, or not. He then gives instances of the occurrence of insects outside the regions in which it is possible for them to become established, owing to climatic conditions and argues that these occurrences may generally be attributed to the agency of air currents [*cf.* R.A.E., A, xiii, 250], and that on this account the collection of data on the subject is of great importance as affording a clue to the directions in which wind drift may be expected to take place.

MAHEUX (G.). **Observations in Quebec in 1925.**—56th Ann. Rept. Ent. Soc. Ontario, 1925, pp. 48-50. Toronto, 1926.

An exceptionally large number of serious outbreaks of insect pests occurred in Quebec in 1925. *Psila rosae*, F. (carrot rust fly) was very widely distributed and probably destroyed at least 75 per cent. of the carrot crop in the Quebec district, while the onion maggot, *Hylemyia antiqua*, Mg. (*Phorbia ceparum*, Mg.) was also an important pest, but was less widely distributed and was in many cases controlled with sodium arsenate. *Phorbia cilicrura*, Rond. (*fusciceps*, Zett.) caused considerable injury to young bean plants in one district; *Pegomyia hyoscyami*, Panz. (spinach leaf-miner), on beets, *Diabrotica vittata*, F., on cucumbers, *Illinoia* (*Macrosiphum*) *pisi*, Kalt., on peas, and *Heliothis obsoleta*, F. (corn ear-worm), were also locally injurious. In several districts a Noctuid, *Barathra occidentata*, Grote, was very abundant, attacking almost every kind of plant and causing much damage to cabbages, celery, beans, raspberries, poplars, and various ornamental plants. Orchard pests included *Saperda candida*, F., *Eriosoma* (*Schizoneura*) *lanigerum*, Hausm., *Schizura concinna*, S. & A., *Capitophorus* (*Myzus*) *ribis*, L., and *Pteronius ribesii*, Scop.

A severe outbreak of *Bucculatrix canadensisella*, Chamb. (birch leaf-skeletoniser) occurred over a considerable area, the trees most affected being *Betula nigra* and *B. populifolia*; in one locality 90 per cent.

of the leaves were infested by an average of three larvae each. The attack of *Paraclemensia acerifoliella*, Clem. (maple leaf-cutter) was again severe on *Acer saccharum* (sugar maple) in the Montreal district; *Hemerocampa leucostigma*, S. & A., on *Salix* and *Acer rubrum*, *H. definita*, Pack., on elm and poplar, *Vanessa antiopa*, L., on elm, and *Datana ministra*, Drury, and *Pemphigus populicaulis*, Fitch, on *Populus tremuloides*, were also recorded during the year. There was at least one instance of *Macrosiphum rudbeckiae*, Fitch, causing considerable damage to *Rudbeckia*.

SHEPPARD (R. A.). **Insect Pests imported on Miscellaneous Plant Products.**—56th Ann. Rept. Ent. Soc. Ontario, 1925, pp. 50–54. Toronto, 1926.

This is an annotated list of insects intercepted during 1924 and 1925 in various plant products, the movement of which is not restricted, imported into Canada from the United States, by road or rail, at Niagara Falls. The following species are included:—

*Ephestia cautella*, Wlk. (fig moth), in shelled almonds from Spain and in peanuts [*Arachis hypogaea*]; *E. kühniella*, Zell. (Mediterranean flour moth), in dried chillies [*Capsicum*] from Uganda, and in beans, including one in a consignment from Italy; *Plodia interpunctella*, Hb. (Indian-meal moth), in shelled almonds from Spain, and probably in lupin seeds from Italy; *Myelois ceratoniae*, Zell., in shelled almonds from Spain; *Cydia (Carpocapsa) pomonella*, L. (codling moth), in pears; *Prodenia commelinae*, S. & A., on tomatoes from Florida; *Hellula undalis*, F. (cabbage webworm), on spinach from Texas; two Pyralid larvae, possibly *Vitula* sp., in bamboo poles from Japan; *Bruchus (Mylabris)* sp. in vetch seed from Holland; *B. (M.) pisorum*, L., in dried garden peas; *B. (M.) rufimanus*, Boh., in beans; *Lasioderma serricorne*, F. (cigarette beetle), in ginger root from Jamaica; *Languria angustata*, Beauv., in dried stems of *Lobelia*; *Platypus* sp., under the bark and in burrows extending an inch into the wood, in lignum vitae from Nicaragua; larvae of *Dermestes* sp., in aniseed from Russia; *Lepidosaphes ulmi*, L. (oyster-shell scale), on cascara and other dried bark; and *Aonidia lauri*, Bch., on bay leaves from Italy.

BRITTON (W. E.). **Some Insects and Entomologists.**—56th Ann. Rept. Ent. Soc. Ontario, 1925, pp. 55–63. Toronto, 1926.

The author gives a brief survey of the history of economic entomology in North America, mentioning the work of many pioneer entomologists, and then discusses some of the problems that face the entomologists of to-day. He urges the need for a large emergency fund, both in the United States and in Canada, that would enable the authorities concerned to take immediate and vigorous measures to eradicate any new introduced pest as soon as it is discovered, and thus save the enormous expenditure that may have to be incurred in controlling it after it has become established.

GILLIATT (F. C.). **Controlling the Brown Tail Moth in Nova Scotia.**—56th Ann. Rept. Ent. Soc. Ontario, 1925, pp. 63–67. Toronto, 1926.

The status of the brown-tail moth [*Nygmia phaeorrhoea*, Don.] in Nova Scotia from 1907, when it was first discovered, to 1925 is

discussed [cf. *R.A.E.*, A, x, 163]; the number of larval webs collected annually during the winter increased from 800 in 1908-9 to 24,000 in 1913-14, but has decreased steadily since then to 154 in 1924-25, and the larvae have never caused defoliation or any appreciable damage. The factors that have been responsible for controlling the pest are discussed, namely, the introduction of natural enemies [*R.A.E.*, A, iv, 336; etc.], climatic conditions, particularly cold, and humidity when associated with low temperatures, spraying, and collecting winter webs. This last measure is thought to have played a larger part than any other factor, especially in the first few years of the outbreak. The collection of 95 per cent. of the webs or more must, in itself, have had an enormous effect on the abundance of the pest, but its influence extends beyond the mere reduction in numbers; the webs that escaped collection were mainly small, and experiments have shown that the percentage mortality of the larvae is considerably higher in small webs than in large ones, and the author is of the opinion that the larvae in small webs tend to produce weak adults, the progeny of which are also weak and form small webs, so that in this way the vitality of the race is diminished. This hypothesis is supported by the fact that the webs collected in recent years have been noticeably smaller than those collected ten or fifteen years ago; moreover, in the areas where the infestation first occurred and was most severe, and where the collection of webs has been carried on for the longest time, the pest has now been exterminated.

In 1913 7,000 cocoons of the Braconid, *Apanteles lacteicolor*, Vier., were sent from Massachusetts to Nova Scotia, where they were liberated; in order that the parasite should not be destroyed by the winter collection of webs of *N. phaeorrhoea* several thousand webs were placed in cages in which the larvae were fed in the spring until the parasite larvae had emerged from them, after which they were destroyed; this procedure was continued until 1922. From 1917 to 1919, webs from 55 localities in Nova Scotia were examined for parasitism by *A. lacteicolor*; the parasite was entirely absent from the webs from 27 localities, while in those from the others the average parasitism varied from less than 1 to 12.25 in each web. Three thousand puparia of the Tachinid, *Compsilura concinnata*, Mg., from Massachusetts were liberated in 1913 and 1915, and a few years later two individuals were recovered from larvae of *N. phaeorrhoea*. In 1914 600 adults of the predacious Carabid, *Calosoma sycophanta*, L., from New England, were liberated, but no specimens were ever recovered. A fungus parasitic on the larvae of *N. phaeorrhoea* was introduced in 1912, but no further efforts were made in this direction on account of the difficulties of establishing and spreading it.

McLAINE (L. S.) & SHORT (S. H.). **The Gypsy Moth Situation in Quebec.**—56th Ann. Rept. Ent. Soc. Ontario, 1925, pp. 67-69. Toronto, 1926.

A brief description is given of the measures taken by the Dominion and Provincial authorities to exterminate the gypsy moth [*Porthetria dispar*, L.], an outbreak of which was discovered in Quebec in 1924 [*R.A.E.*, A, xiii, 581]. In the autumn of 1924 a survey of the infested area resulted in the discovery of 2,695 egg-clusters, including 650 that were old. In the spring, trees were banded with an adhesive to prevent larvae hatching on the ground from reaching the leaves, and

above this with burlap, under which the larvae could shelter; the burlap bands were turned at frequent intervals after the larvae had attained sufficient size; when hatching began a kerosene burning outfit was used on 600 yards of stone walls; trees throughout the infested area were sprayed at the end of June and again from 10th to 14th July with lead arsenate. At the beginning of November scouting was begun again in the infested area, and by the middle of the month no new egg-clusters had been found. In addition to the intensive work in the infested area, over 2,000 square miles of country were surveyed during 1925, including all the main highways entering Quebec from the United States, but no sign of the pest was found.

HUTCHINGS (C. B.). **The Birch Leaf Skeletonizer, *Bucculatrix canadensisella* Chamb.**—56th Ann. Rept. Ent. Soc. Ontario, 1925, pp.69-71. Toronto, 1926.

*Bucculatrix canadensisella*, Chamb., commonly attacks birches, especially paper birch [*Betula papyrifera*] and yellow birch [*Betula lutea*], throughout eastern Canada, New York and the New England States; at intervals a severe outbreak occurs, and birches are defoliated over large areas. The adults emerge in the first half of July, and the eggs are laid on the undersides of the leaves, close to one of the veins. The eggs hatch in about two weeks, and the larvae at once mine in the leaves, from which they emerge in 7-8 days for the first moult. When a first instar larva has emerged from the leaf, it spins a silken mat near the junction of two veins, cuts in it a circular hole through which it crawls, closing the hole afterwards with silk, and, protected by the mat, casts its skin; the preparations for the first moult occupy about 24 hours in warm weather, but as long as 3 days in cooler weather. After moulting, the larva emerges from beneath its mat at the edge, where it is attached to the leaf, and feeds on the leaf surface for 3 days, after which it spins a second moulting cocoon, similar to the first, but thinner in texture, and after 24 hours again casts its skin, and emerges. It feeds for a further  $3\frac{1}{2}$ -4 days on the leaf, when it becomes full-grown, drops to the ground, spins a silken cocoon, the construction of which is described, attached to a leaf or some other object, and pupates. The adult emerges in the following July. Ornamental birches can be protected from serious injury by spraying with lead arsenate or nicotine sulphate about the middle of August, when the mines begin to show.

MCLAINE (L. S.). **A Preliminary Announcement on the Outbreak of the European Pine Shoot Moth.**—56th Ann. Rept. Ent. Soc. Ontario, 1925, pp. 71-72, 1 ref. Toronto, 1926.

In the spring of 1925 larvae of *Rhyacionia buoliana*, Schiff. (European pine shoot moth) were found infesting buds of young pines imported into Ontario from Holland, and the pines affected were destroyed. At the end of June injury by this moth was reported from Toronto, where young pines imported from Holland two years previously, and others in the vicinity, were attacked, and investigation showed that the pest was present in several parts of the city. It has subsequently been reported from five other localities in Ontario and from Victoria, British Columbia. It is intended to inspect all pines imported into Canada since 1st September 1923, in order to obtain information on the distribution of *R. buoliana* with a view to adopting measures for its eradication, if possible.

CAESAR (L.). **Mortality of the European Corn Borer** (*Pyrausta nubilalis* Hüb.) **Adults and Larvae.**—56th Ann. Rept. Ent. Soc. Ontario, 1925, pp. 72–75, 1 ref. Toronto, 1926.

The damage to maize caused by *Pyrausta nubilalis*, Hb. (European corn borer) in Elgin County, Ontario in 1924 was very severe, but in 1925 there was a decided decrease, which could not be attributed to exceptional winter mortality of the larvae or improved control measures. As the weather conditions in 1924 might have been particularly favourable to the moths during the oviposition period, experiments were made to test the effect of shade, moisture and temperature on the longevity and egg-laying capacity of the adults in 1925, by placing moths in cages over maize plants in the open. The experiments presented considerable difficulties, and it is intended to repeat them in order to obtain more accurate data. Moths without moisture, even dew (there was scarcely any rain during the experiments), usually died in less than 4 days, and the females laid an average of 41 eggs each. When supplied with moisture, either by sprinkling or dew, the moths lived about half as long again, and the average number of eggs laid by each female was 142. When there was a constant supply of water and a slightly lower temperature, the moths lived nearly three times as long as when there was no moisture and nearly twice as long as when moisture was supplied twice a day and the temperature was not lowered, and the average number of eggs laid by each female was 563.

Eggs showed a greater tendency to peel off the leaves before hatching in 1925 than in 1924, and there was a larger percentage of parasitism, but mortality in the egg stage has been considered, for the sake of simplicity, as larval mortality. In 1924 [*R.A.E.*, A, xiii, 580] it was found that 77.7 per cent. of the larvae died in the early stages, but in an exactly similar experiment in 1925, involving 3,900 eggs instead of 8,100, 93.6 per cent. of the eggs failed to produce larvae that survived beyond the early instars. In another experiment some moths were placed in a cage over maize in the field, and the eggs laid in normal positions were counted; only 8 out of 383 produced larvae that survived 15 days later. The cause of the higher mortality among larvae in 1925 as compared with 1924 cannot be definitely stated, but it is most probable that the higher temperature and lower relative humidity, and consequent greater evaporation, especially in July, when oviposition took place and the eggs hatched, were responsible. It is also probable that the number of eggs laid was considerably less in 1925 than in 1924, on account of weather conditions.

KEENAN (W. N.). **The Spread and Degree of Infestation of the European Corn Borer in 1925.**—56th Ann. Rept. Ent. Soc. Ontario, 1925, pp. 75–77. Toronto, 1926.

Details are given of the spread of the European corn borer [*Pyrausta nubilalis*, Hb.] in Ontario in 1925, and the degree of infestation in the different parts of the infested area [*cf. R.A.E.*, A, xiii, 579; xiv, 267]. The newly infested districts comprise 1,789 square miles. Within a radius of about 15 miles from the more important of the original foci of the outbreak [*R.A.E.*, A, ix, 14, 147], the degree of infestation decreased, but in every other district there was an increase. In almost all cases the records of infestation have confirmed the importance of late planting in reducing damage; on 15th September maize sown on

13th, 15th and 26th May and on 2nd and 4th June was examined ; 100 per cent. of the stalks of the first four sowings and 98 per cent. of the last were infested, but the number of larvae to each stalk, which is the important factor in crop losses, was much smaller in the late sowings, averaging about 12 for the crops sown in June against 23-38 for those sown in May, and less than 50 per cent. of the cobs were infested in the former as against 100 per cent. in the latter.

BAIRD (A. B.). **Recent Developments in the Introduction of Parasites of the European Corn Borer in Ontario.**—56th Ann. Rept. Ent. Soc. Ontario, 1925, p. 78. Toronto, 1926.

A brief account is given of the work of breeding and liberating introduced parasites of the European corn borer [*Pyrausta nubilalis*, Hb.] in Ontario in 1925 ; this was carried out on the same lines as previously [*R.A.E.*, A, xiii, 581], the species concerned being the Braconid, *Microbracon* (*Habrobracon*) *brevicornis*, Wesm., and the Ichneumonid, *Pimpla* (*Exeristes*) *roborator*, F. Adults of *M. brevicornis* over-wintered successfully in maize stalks in cages and emerged at the end of April ; during the season 951,000 adults of this species were liberated, including 331,000 derived from a consignment of cocoons received from Hungary through the United States Bureau of Entomology. In Hungary *M. brevicornis* has one generation a year, whereas in the parts of Europe from which the other consignments came it has two. The number of adults of *P. roborator* liberated in 1925 was 36,700, as compared with 15,800 in 1924 ; more than 75 per cent. of these were females, almost all of which had already mated ; the females were seen ovipositing, and immature stages of the parasite were recovered in the vicinity of the liberations.

Parasitism of *P. nubilalis* by native parasites is still almost negligible ; the most important is the Chalcid, *Trichogramma minutum*, Riley, which parasitises a small proportion of the egg masses deposited late in the season. The Tachinid, *Zenillia caesar*, Aldr., was bred from over-wintering larvae.

HUDSON (H. F.). **Egg Studies of the Clover Leaf Curculio, *Sitones hispidulus* Fab.**—56th Ann. Rept. Ent. Soc. Ontario, 1925, p. 79. Toronto, 1926.

*Sitona* (*Sitones*) *hispidula*, F. (clover leaf weevil) is a minor pest of clover and lucerne in Canada, but the author has not observed it on sweet clover [*Melilotus*]. It hibernates as an adult, preferably where clover debris is abundant, and there is considerable winter mortality that is probably due to lack of sufficient protection. Oviposition usually begins early in May. Eggs were laid on both surfaces of the leaves, and a few on the petioles and stems, but 80 per cent. were laid either on the breeding cages or on the soil. The oviposition period of individual females extended to 43 days, the largest number of days on which a female laid eggs being 25 ; the average number of eggs laid by each was 69, and the maximum for an individual 165. The average incubation period varied according to temperature from 31 to 15 days. The period from egg to adult was about 6-7 weeks in the field.

MARSHALL (J.). **The Striped Cucumber Beetle, *Diabrotica vittata* Fab.**  
—56th Ann. Rept. Ent. Soc. Ontario, 1925, pp. 80–83. Toronto,  
1926.

The adults of *Diabrotica vittata*, F. (striped cucumber beetle) begin to appear in May or early June in Ontario, as soon as the weather is warm and the daily maximum temperature about 80° F., and continue to do so for 3–4 weeks; they feed on all kinds of cultivated cucurbits and on wild cucumbers, and to some extent on other plants. The injury to cucurbits is mainly caused by the adults feeding on the young leaves, up to the time that the plants form runners, after which growth is so rapid that the beetles do little damage; injury to the flowers is slight and injury to the fruit rare in Ontario [cf. R..I.E., A, xiv, 353]. The transmission of mosaic disease or yellows by the adults was confirmed experimentally, but all efforts to transmit wilt [*Bacillus tracheiphilus*] failed, although other investigators have proved that *D. vittata* is a vector of this disease.

Oviposition begins about 2 weeks after the appearance of the adults in the field, the eggs being laid in the earth or under clods, near the stem of the food-plant. The incubation period varies from 5 to 14 days. The larvae burrow in the primary and secondary roots and also feed on the fibrous ones, but are apparently confined to cucurbits. In the laboratory the average larval period was 26 days; it is probably longer in the field. Pupation takes place in an earthen cell in the soil, at a depth of 1–3 inches, and the adult emerges from 8 to 17 days after the cell is made, the earliest dates for emergence being 16th July in 1922 and 9th and 6th August in 1924 and 1925. No evidence was obtained that suggested the occurrence of more than one generation a year. Hibernation appears to take place exclusively, or almost exclusively, in the adult stage.

Experiments with over sixty dusts, sprays, fumigants and baits were made, and the results with the four most successful are discussed. These were hydrated lime containing 2 per cent. free nicotine; a dust consisting of 8 per cent. nicotine sulphate (40 per cent.), 25 per cent. anhydrous copper sulphate and 67 per cent. hydrated lime; calcium arsenate and gypsum, 1:20, by weight; and sodium fluosilicate and hydrated lime, 1:9, by volume. Both the dusts containing nicotine are unsatisfactory on account of their cost under Ontario conditions, which necessitate several applications; free nicotine dust kills more quickly than the dust containing copper sulphate, but the latter remains toxic longer and is a good repellent; both these dusts give off pungent fumes that make their application difficult. In cage experiments, when all the plant surface was dusted, the calcium arsenate and gypsum dust killed 62 per cent. of the beetles and the sodium fluosilicate and hydrated lime dust 66 per cent. When half the plant surface was dusted these figures were 42 and 35, respectively, indicating that considerable mortality is obtained without dusting the entire plant or the beetles themselves. These two dusts were, with the exception of the dust containing copper sulphate, the best repellents tested, the calcium arsenate and gypsum being slightly superior in this respect. The sodium fluosilicate and lime mixture was the easiest dust to apply of those tested, spread well, and was satisfactory under damp conditions; it did not injure the plants. The calcium arsenate and gypsum mixture tended to clog the duster in damp weather. The cost of the two mixtures is almost the same, and the cost of dusting

1 acre with either should be about 14–19 shillings a year, for 4 or 5 applications, including labour. Sodium fluosilicate more finely ground than that used may prove to be the best dust for controlling *D. vittata*, but for the present the use of calcium arsenate and gypsum is advised.

DAVIAULT (L.). **Garden Insects of 1925 in Montreal District.**—56th Ann. Rept. Ent. Soc. Ontario, 1925, pp. 83–85. Toronto, 1926.

The onion maggot, *Hylemyia antiqua*, Mg. (*Phorbia cepetorum*, Meade), and the cabbage root maggot, *Phorbia* (*Pegomyia*) *brassicae*, Bch., continued to be serious pests in gardens. In many cases, usually on soil that had been too heavily manured, maize had to be resown on account of the corn root maggot, *Phorbia cilicrura*, Rond. (*Pegomyia fusciceps*, Zett.). The foliage of potatoes was severely injured by the potato flea-beetle, *Epitrix cucumeris*, Harr., but the attack had apparently little effect on the crop. Peas in one area were heavily infested with *Illinoia* (*Macrosiphum*) *pisi*, Kalt., but spraying with nicotine sulphate controlled the Aphids effectively. The tarnished plant bug, *Lygus pratensis*, L., was a serious pest of chrysanthemums. A preliminary investigation was made of the Jassids injurious to vegetable crops on soils containing a large amount of clay and in boggy places [*R.A.E.*, A, xiv, 122].

PETCH (C. E.) & HAMMOND (G. H.). **Parasites of White Grubs in Southern Quebec. A Progress Report.**—56th Ann. Rept. Ent. Soc. Ontario, 1925, pp. 89–91. Toronto, 1926.

This paper summarises the results obtained during 1925 in the investigation of the parasites of white grubs [*R.A.E.*, A, xiii, 578]. A brief account is given of the biology of *Lachnosteria* (*Phyllophaga*) *anxia*, Lec., which is the only species of economic importance in southern Quebec [cf. *R.A.E.*, A, vi, 364]. The life-cycle occupies three years, and the broods are very strongly differentiated, overlapping to an extent of less than 1 per cent.; 1922 and 1925 were important flight years of the adults, and 1928 will undoubtedly be the next. Second and third year larvae were injurious to crops in 1923 and in the spring of 1924, when they became full-grown, and were quiescent for several weeks before pupation, which occurred from the middle of July to the end of August. The pupal period lasted about 45 days, transformation to the adult taking place from the middle of August to October. The adults began to emerge on 14th May 1925, and the main flight period continued for a month; mating occurred between 26th May and 2nd June on the favourite food-plants, namely white elm, white oak [*Quercus alba*], *Populus alba*, *P. tremuloides* and raspberry. Eggs hatched from 28th June to 16th August; the average incubation period in the laboratory was 47 days. First year larvae hibernate in the second instar.

The great fluctuations in the number and development of the larvae of *L. anxia* have a marked effect on the abundance of its principal parasites, the Scoliid, *Tiphia inornata*, Say, and the Tachinid, *Microphthalma michiganensis*, Towns. (*phyllophagae*, Curran). The adults of *T. inornata* were abundant in 1925; the males appeared in large numbers on 4th June, and the females about 10 days later; both sexes were present in fair numbers from 12th to 29th June, but the males had mainly disappeared by 5th July, while the activity of the females continued until 26th July, reaching its height on 13th July.

Although larvae of *L. anxia* were scarce during this time, the percentage of parasitism was small, and it was expected that adults of *T. inornata* would be scarce in 1926, but that, the second year larvae of *L. anxia* being then large enough to support the parasites, there should be an increased emergence of adults in 1927, when a plentiful supply of third year larvae should enable the conditions of 1925 to be reproduced in 1928. The eggs of *T. inornata* were deposited in the folds of the anterior thoracic segments of the larvae, where about 30 per cent. were crushed by the contortions of the host; the incubation period was about 15 days and the larval period about 30 days, cocoons being spun between 15th August and 10th September. Females showed a marked preference for third year grubs for oviposition, and those already parasitised by *M. michiganensis* were not rejected.

Adults of *M. michiganensis*, abundant in 1924, were scarce in 1925, probably because by the time of their emergence in 1924 all the third year grubs had transformed either to pupae or adults, and only a few second year grubs were available, so that only a small proportion of the parasite larvae succeeded in finding hosts; the percentage of parasitism was, however, high, and 45 per cent. of the third year grubs in 1925 were parasitised, the average number of larvae of *M. michiganensis* in each being 1.9. Pupation took place from 13th June to 10th August, and emergence from 21st June to 24th August. In the autumn of 1925 such white grubs parasitised by *M. michiganensis* as were turned up in ploughing were almost all in their second year, first year grubs being rarely attacked. Notes are given on the morphology and biology of the larva, which has 4, or possibly 5, instars.

Of 259 Asilid larvae collected in the autumn of 1924, and placed in tins of earth, only 37 were alive in May 1925; of these 13, some of which had been provided with white grubs as food, pupated successfully in June and July, and after an average period of 36 days produced adults that were identified as *Asilus snowi*, Hine; the pupa is described. Adults of *A. snowi* were much more abundant in 1925 than in the previous two years and destroyed many injurious Diptera and Lepidoptera, especially *Tortrix (Cacoecia) cerasivorana*, Fitch (cherry-tree ugly nest moth), which was locally common.

The Ortalid, *Pyrigota undata*, Wied., which parasitises the adults of *L. anxia*, was fairly common in June; it is apparently active both by day and at night, as it was taken at light traps; parasitism by this species amounted to less than 0.1 per cent. Several specimens of the Anthomyiid, *Hydrotaea houghi*, Mall., were reared from dead adults of *L. anxia* in July; this species is believed to be saprophytic. A single pupa of the Proctotrupoid, *Pelecinus polyturator*, Drury, was found near the remains of a white grub from which the larva had emerged. The mites, *Rhizoglyphus phylloxerae*, Riley, and *Tyroglyphus armipes*, Bks., which were common on third year white grubs in 1924, were not nearly so numerous on third year grubs in 1925, and were rarely found on first year grubs.

HUDSON (H. F.). **Notes on the Life History of the Clover Root Borer, *Hylastinus obscurus*.**—56th Ann. Rept. Ent. Soc. Ontario, 1925, pp. 92-93. Toronto, 1926.

The Scolytid, *Hylastinus obscurus*, Marsh. (clover root borer) is not regarded as an important pest of clover in Ontario, as it normally confines its attacks to plants in their second year of growth, after

which they are usually ploughed in. Sometimes, however, if a field containing clover is left fallow it may serve as a source of infestation for a field of young clover in the vicinity, and considerable damage may result. Between 27th April and 18th May 159 clover roots were found to contain 474 live adults, 11 larvae and 4 pupae of *H. obscurus*, besides some dead adults. It is concluded that hibernation may take place either in the adult or larval stage, and also possibly in the pupal stage. The beetles migrated to new plants in May, and oviposition began in the latter part of that month and continued throughout the summer, the longest period for an individual being 67 days; the largest number of eggs laid by one beetle was 16. The females enter the plants through the crown or stem or at the side of the root and make a winding burrow down the root, excavating at intervals a hole in which a single egg is laid, and usually lay from 2 to 6 eggs in one root. The incubation period varied from 9 to 17 days. Pupae were first found in the field on 15th July, but were less numerous than larvae even in the autumn. The beetle can be controlled by ploughing in clover after the second crop has been cut and destroying self-sown plants.

KING (K. M.) & ATKINSON (N. J.). **The Relation of the Red-backed Cutworm to Diversified Agriculture in Western Canada.**—*Sci. Agric.*, vii, no. 3, pp. 86-91, 1 map, 7 refs. Ottawa, Ont., November 1926.

Attempts are being made in Western Canada to replace the cultivation of cereals alone by diversified agriculture. The principal crops to be introduced for this purpose are sweet clover, lucerne, flax, maize and sunflowers. Unfortunately these plants are more susceptible to injury by *Euxoa ochrogaster*, Gn. (red-backed cutworm) than grain crops, and the abundance of this moth is further encouraged by the presence of flowers that provide food for the ovipositing females and the more suitable nature of the soil for oviposition, as a result of intertilling. *E. ochrogaster* may, however, be controlled under farm conditions by the use of poisoned baits [*R.A.E.*, A, xiv, 431].

A review of past infestations shows that serious outbreaks of this cutworm occur at irregular intervals of about 5 years in the Prairie Provinces. The factors causing this periodicity are not yet clearly understood, but are apparently mainly related to weather conditions and the prevalence or absence of natural enemies. It is tentatively concluded that *E. ochrogaster* is ecologically closely associated with cold temperate forest and savanna conditions, and there are indications that in the savanna belt, limited localities occur in which *E. ochrogaster* maintains itself during unfavourable periods, and from which the infestation spreads rapidly and widely under favourable conditions.

It is expected that the range of economic importance of this cutworm will be greatly increased as agriculture extends into the more northern districts of the Prairie Provinces, particularly in Saskatchewan and northern Alberta.

VENABLES (E. P.). **The Fruit-tree Leaf-roller, *Cacoecia argyrospila* Walk., and its Control in British Columbia.**—*Canada Dept. Agric.*, Ent. Branch Circ. 10, revd. edn., 4 pp., 4 figs. Ottawa, Ont., March 1926. [Recd. November 1926.]

This is a short account of the life-history of *Tortrix* (*Cacoecia*) *argyrospila*, Wlk., and the injury it causes in the Okanagan Valley

[R.A.E., A, ix, 164; xii, 485]. Experiments during the past four years have shown that thorough application of a miscible oil spray during the dormant period is an effective measure. A spray containing 7 per cent. of oil when diluted will give excellent results, provided that the trees are thoroughly covered. Where the dormant oil spray has been omitted, or even where it has been applied, it is advisable to make two applications of lead arsenate at the rate of 8 lb. powder to 160 gals. water. The first should be made when the bud clusters are separating, and the second as soon as the petals have fallen, this latter corresponding to the usual calyx spray against codling moth [*Cydia pomonella*, L.].

The arsenical sprays used against *T. argyrospila* will also destroy the larvae of *T. (C.) rosaceana*, Harr., emerging from their hibernating quarters in the spring; to prevent injury by the newly hatched larvae of this species, arsenicals must be applied at the time of hatching in July.

PETCH (C. E.). **The Apple Curculio and its Control in Quebec.**—*Canada Dept. Agric., Ent. Branch Circ. 36, revd. edn., 4 pp., 5 figs., 1 ref. Ottawa, Ont., February 1926. [Recd. November 1926.]*

*Tachypterellus (Anthonomus) quadrigibbus*, Say (apple curculio) is widely distributed in North America and destroys a considerable portion of the crop in all the apple growing sections of Quebec. Besides apple it also attacks pear, plum, wild crab, cherry and hawthorn and has recently been found on cotton in Florida. The fruit, tender twigs and leaf petioles are injured. In Quebec *A. quadrigibbus* shows a preference for certain varieties of apples. It apparently occurs in great abundance about every 10 years, though the exceptional infestations recorded in 1914 and 1924 may have been only a coincidence.

The winter is passed in the adult stage under débris. The weevils appear on the trees shortly before the blossoming period, beginning their attack on the fruit as it is forming. The eggs are laid in cavities beneath the skin of the fruit; they hatch in 4-7 days, and the larvae tunnel into the flesh of the apple. They eventually reach the core, pupation occurring in the cavity thus made. The adults from these pupae emerge about 20th July and remain active until September, when they enter hibernation. The punctures made for oviposition and feeding arrest the growth of the apples and cause the appearance of hard green areas extending to the centre of the fruit.

In districts where the weevils have become a serious pest thickets of wild crab and hawthorn should be destroyed in the vicinity of orchards, and all fence rows and stone walls should be burned over for a rod or so on either side in April or May so as to destroy any individuals hibernating under the débris.

Arsenical sprays and dusts will give good results if applied at the proper time; their efficacy is increased by the addition of lime-sulphur to the sprays and of sulphur to the dusts, which act as deterrents. The pink bud application should be delayed as long as possible, while the calyx application should be made when about 60 per cent. of the petals have fallen. Another spray should be applied a week after the calyx spray. The spray recommended consists of 1½ lb. lead arsenate powder to 40 gals. water or preferably lime-sulphur solution containing 1¼ gals. commercial lime-sulphur for the pink spray and

1 gal. for the later spray. For dusting 10 lb. lead arsenate should be used in every 100 lb. of dust. Calcium arsenate may be substituted for lead arsenate in the dust or spray, using half the quantity; when it is used alone in water, an equal weight of hydrated lime should be added.

The most satisfactory dust used was composed of 50 lb. superfine dusting sulphur, 45 lb. grade A talc, and 5 lb. calcium arsenate.

Ross (W. A.). **Two Orchard Scale Insects. The San José Scale and the Oyster-shell Scale.**—*Canada Dept. Agric.*, Ent. Branch Circ. 37, 4 pp., 4 figs. Ottawa, Ont., April 1925. [Recd. November 1926.]

A brief account is given of the bionomics of the San José scale [*Aspidiotus perniciosus*, Comst.], and oyster-shell scale [*Lepidosaphes ulmi*, L.]. The former may be controlled by spraying in the autumn just after the leaves have fallen or in the spring, with 5 gals. commercial lime-sulphur to 35 gals. water. Pruning old neglected trees and clearing the loose bark from trunks and large limbs are also important measures.

The same spray is effective against *L. ulmi* as a dormant or delayed dormant application. For the calyx spray 1 gal. commercial lime-sulphur to 40 gals. water should be used in combination with lead arsenate or calcium arsenate. Trees and shrubs that are not regularly sprayed may be treated with the dormant or delayed dormant spray, or they may be sprayed when the young scales hatch with 1 gal. lime-sulphur,  $\frac{3}{4}$  pt. nicotine sulphate and 40 gals. water. In the case of severe infestation both applications should be made and repeated annually until the scale is controlled.

Ross (W. A.). **The European Red Mite—A Pest of Fruit Trees.**—*Canada Dept. Agric.*, Ent. Branch Circ. 39, 4 pp., 5 figs. Ottawa, Ont., May 1925. [Recd. November 1926.]

*Paratetranychus pilosus*, C. & F. (European red mite) infests all the common fruit trees, being particularly a pest of plums in Ontario. A brief account is given of its life-history and control. Plum trees should be sprayed with commercial lime-sulphur, 1:40, when the fruit is set and most of the blossoms have fallen and again 2 weeks later. Considerable injury to apples may be prevented by applying the spray when the buds are showing pink and again after the blossoms have fallen.

**Studies on Sugar-cane Insects.—I.** SALT (G.). **Report on Sugar-cane Borers at Soledad, Cuba.**—**II.** MYERS (J. G.). **Dry-season Studies of Cane Homoptera at Soledad, Cuba, with a List of the Coccids of the District.**—*Contrib. Harvard Inst. Trop. Biol. & Med.*, iii, 110 pp., 4 pls., 2 figs. Cambridge [Mass.], Harvard Univ. Press, & London, H. Milford, Oxford Univ. Press, 1926. Price 11s. net.

These two papers, which have previously appeared separately [*R.A.E.*, A, xiv, 497, 498], have now been issued in one volume.

URICH (F. W.). **Insects affecting Coffee in Trinidad and Tobago.**—*Proc. Agric. Soc. Trinidad & Tobago*, xxvi, pt. 8, pp. 384–388. Port-of-Spain, 1926.

No insect pests of coffee in Trinidad are yet of major importance, but as this crop is being more extensively cultivated a preliminary list of them is given. This includes: the weevil, *Brachyomus tuberculatus*, Boh., *Heliethrips haemorrhoidalis*, Bch., *Leucoptera coffeella*, Guér., and Chrysomelids of the genera *Colaspis*, *Diabrotica* and *Nodonota*, attacking the leaves; *Coccus viridis*, Green; *Araecerus* (*Araecerus*) *fasciculatus*, DeG., and a small Scolytid beetle in dry berries on the plants; and a species of *Heterodera* in the roots. Short notes on these pests and their control are given.

SMITH (E. B.). **Trap Light Experiment at Woodford Lodge Estate.**—*Trinidad & Tobago: Min. & Proc. Froghopper Invest. Comm.*, pt. iv, pp. 76–77. Trinidad, 1926.

These experiments were carried out in sugar-cane fields infested with adult froghoppers [*Tomaspis saccharina*] in large numbers; the fields were cleared of all weeds and grass so as to make the light more effective. The trap consisted of an ordinary hurricane lantern placed in the centre of a galvanised iron tray 2 ft. by 1½ ft. by 2½ in., the sides sloping at about 45° and reinforced by wood on the outer edges to give rigidity, and the long sides projecting 9 in. at each end to serve as handles. The lantern was kept in position by twine stretched diagonally from corner to corner of the tray. The tray was then partly filled with thick molasses and a film of fuel oil spread over the surface so as to kill the insects alighting on it. Four lights used in line covered a conveniently wide breadth of the field. The traps should be started immediately after sunset, and the maximum catch occurs during the first two hours; after 10 or 10.30 p.m. only about 750 individuals an hour are caught in each trap. The trays are first placed across a trace drain on the outer edge of the first row, and the canes are agitated by shaking the stems. The lights should be moved forward together and care should be taken that the froghoppers can always see the lights during shaking. By means of these traps, a total of 555,000 froghoppers was caught in six fields, one of which was treated for two nights and the others once. Of 8,350 examined 43·1 per cent. were females.

FOLLETT-SMITH (R.) & HARDY (F.). [**Notes on the Results of “Cyanogas” Dusting Trials for Destroying Froghopper Nymphs.**]—*Trinidad & Tobago: Min. & Proc. Froghopper Invest. Comm.*, pt. iv, pp. 83–97. Trinidad, 1926.

The results of various tests with cyanogas calcium cyanide “A” dust [*R.A.E.*, A, xiv, 74] against nymphs of the sugar-cane froghopper [*Tomaspis saccharina*], conducted by the authors on various estates in Trinidad, are summarised by Hardy. He concludes that this dust is quite satisfactory as an insecticide against the nymphs in spittle, and is easily applied with a hand-duster by estate labourers under supervision. It is apparently harmless to cane plants if applied only to stem bases and to adventitious roots. It rapidly decomposes, evolving hydrocyanic acid gas and leaves only slaked lime as a residue

in the soil. Its lethal power probably lasts only 4 to 6 hours in damp (not wet) soil and therefore produces no harmful after-effects; it is easily applied and handled. There is some indication that eggs as well as nymphs were killed. The powder was effective even on soil that was quite moist, but should probably not be used during rain; more than one application may be necessary. The best results were obtained by using about 30 lb. to the acre; this may possibly be diluted successfully with a carrier. The disadvantages of the cyanogas powder are that it is rather expensive, is liable to rapid deterioration if not carefully stored in air-tight containers, is apt to clog the hand-dusters if these are not thoroughly lubricated, and destroys beneficial insects and such small animals as lizards and frogs when in contact with them or in close vicinity. Though not usually dangerous to the operator dusting should be begun to windward of the field, and the faces and hands of operators should be kept free from the dust or washed immediately after dusting is completed.

HARDY (F.). **A Preliminary Trial with "Cyanogas" Powder as Insecticide for Froghopper Adults.**—*Trinidad & Tobago: Min. & Proc. Froghopper Invest. Comm.*, pt. iv, p. 98. Trinidad, 1926.

A trial of cyanogas calcium cyanide powder as a dust against the adults of sugar-cane froghopper [*Tomaspis saccharina*] gave very poor results, and, even if it had been effective, the cost of the powder almost prohibits its use in this manner.

WALTERS (E. A.). **Viability of the Weevil (*Cosmopolites sordidus*, Germar) and the Banana Borer (*Tomarus bituberculatus*, Beaud.).**—*Rept. Agric. Dept. St. Lucia, 1925*, p. 8. [Trinidad] 1926.

The resistance of the weevil, *Cosmopolites sordidus*, Germ., and the Dynastid, *Ligyris ebenus*, DeG. (*Tomarus bituberculatus*, Beaud.) to long immersion in water was tested in 1925. After thorough soaking of infested banana plants for 48 hours, adults of the weevil were found alive. Both pests withstood soaking for 12 days in water, 4 days in lime-water, or 5 days in weak disinfectant when not totally immersed. Total immersion of the plants in lime-water was, however, very effective in inducing the insects to escape from the plants into the liquid, in which they were killed. The soaking of planting material in lime-water for 48 hours has now been adopted as an effective measure for reducing both pests without injury to the plant.

WALTERS (E. A.). **Control of Insect Pests.**—*Rept. Agric. Dept. St. Lucia, 1925*, pp. 11–12. [Trinidad] 1926.

The infestation of coconuts by Coccids and by the coconut whitefly [*Aleurodicus cocois*, Curt.] was less severe in St. Lucia in 1925 than usual, probably on account of the humid conditions that prevailed and encouraged the growth of entomogenous fungi. *Metamasius sericeus*, Ol. (striped weevil borer), recorded in the previous year as attacking coconuts, was also found in banana stools in company with *Cosmopolites sordidus*, Germ. (banana weevil). On limes, a bad infestation of the bark borer, *Leptostylus praemorsus*, F., occurred on one estate. Mole crickets [*Scapteriscus vicinus*, Scud.] caused trouble in sugar-cane fields by gnawing away the softer parts of the root system. The cane

stools should be burnt after harvest in order to destroy the different stages of the insect; careful selection of cuttings and preservation of birds as a natural control are also recommended. Sweet potatoes were in several cases badly attacked by *Euscepes* (*Cryptorrhynchus*) *batatae*, Waterh., which destroyed the roots. Infestation was severe on land that had been sown with sweet potatoes for several seasons.

JACKSON (T. P.). **Work Connected with Insect and Fungus Pests and their Control.**—*Rept. Agric. Dept. St. Vincent, 1925*, pp. 13–18, 20. Trinidad, 1926.

The numbers of *Dysdercus delauneyi*, Leth. (cotton-stainer) were almost negligible except in one district. This locality is particularly fertile, and weeds, which consist chiefly of indigo, *Sida* and *Momordica*, grow vigorously. The indigo, which grows among the cotton, is peculiarly adapted to collect and retain seed cotton during the reaping season, so that the stainers have large quantities of food available at the end of each crop. After the destruction of the indigo the insects migrate to the edges of the field and feed on the seeds of the other weeds. The simultaneous destruction of all weeds and the setting of traps would probably reduce infestation. The campaign against this pest was continued on the same lines as in previous seasons [*R.A.E.*, A, xiv, 86].

The measures used against *Platyedra gossypiella*, Saund. (pink boll-worm) have been thoroughly carried out, and the pest has been well controlled. Apparently the moths do not travel, to any great extent, from one field to another, so that if a field is badly attacked early in the season it is probable that it had not been thoroughly cleaned up after the previous season's crop, or that the seed was not properly fumigated. Experiments indicated that the bollworm caused 10 per cent. of the seed to be practically useless for planting or oil extraction. Other experiments showed that exposure to the sun injures the resting stage larvae left in the field after the crop is over. It is therefore suggested that the cotton fields should be cleaned and a few weeks allowed to elapse before any green crop is planted, so that there is no shade to protect the larvae. Incidentally, the danger of interplanting cotton with other crops that may shed leaves and form a covering for infested seeds and bolls is pointed out.

Minor pests of cotton were *Nezara viridula*, L., which was controlled on one estate by destroying all leguminous weeds and ceasing to grow beans and peas, *Colaspis fastidiosa*, Lef. (bronze beetle), *Eriophyes gossypii*, Banks (leaf blister mite), *Saissetia nigra*, Nietn. (black scale), and *Pinnaspis* (*Hemichionaspis*) *minor*, Mask. (white scale).

In one of the islands of the Grenadines considerable difficulty was experienced in establishing the cotton crop owing to an earwig, which ate the leaves of the very young plants. Towards the end of the year in the same island the crop was damaged by a severe and persistent attack of *Alabama argillacea*, Hb.

Red ring disease of coconuts, caused by the Nematode, *Aphelenchus cocophilus*, Cobb, has made no progress, probably owing to the fact that the last two years have been exceptionally dry.

The experiments made in 1924 [*R.A.E.*, A, xiv, 87] to test the effect on the arrowroot crop of defoliation of the plant were repeated in

1925. In this case the plants from which the leaves were removed in four instalments gave an increased yield, while decreased yields were obtained from those from which the leaves were removed at once, or gradually during a week. The results of the two years' experiments would seem to show that defoliation by *Calpodes ethlius*, Cr. (arrowroot worm) should have no serious effect on the yield of arrowroot.

Other pests were *Diatraea saccharalis*, F., *Metamasius* (*Sphenophorus*) *sericeus*, Ol., and mealybugs [*Pseudococcus*] on sugar-cane; *Heliothrips rubrocinctus*, Giard, on cacao; *Euscepes* (*Cryptorrhynchus*) *batatae*, Waterh., and *Tetranychus telarius*, L., on sweet potatoes; *Rhynchophorus palmarum*, L., *Aleurodicus cocois*, Curt., and *Aspidiotus destructor*, Sign., on coconuts; and *Laphygma frugiperda*, S. & A., (corn ear worm).

GOWDEY (C. C.). **Catalogus insectorum jamaicensis.**—*Dept. Agric. Jamaica*, Ent. Bull. 4, pt. 1-2, iv, 114, xiv, 10 & ii pp. Kingston, 1926.

The first part of this bulletin is a catalogue of the insects of Jamaica, and the second part is a supplementary list of species. In some cases synonymy is given and food-plants or hosts are mentioned.

In an appendix, C. H. Curran describes a number of new species of Diptera, including the Tachinids, *Hypostena* (*Tachinophyto*) *grisea*, sp. n., reared from the larvae of *Diatraea saccharalis*, F., and *Atacta geminata*, sp. n., reared from the larvae of *Protoparce sexta jamaicensis*, Kby.

JABLONOWSKI (J.). **Zur Klärung der Thripschädenfrage.** [On the Elucidation of the Question of Thrips Injuries.]—*Zeitschr. angew. Ent.*, xii, no. 2, pp. 223-242, 2 figs., 10 refs. Berlin, November 1926.

In recent years there has been a great increase in the number of Thysanoptera that have been classed as injurious, but it is possible that the economic importance of many has been over-estimated. Of the well known species, some are undoubted pests, but *Limothrips cerealium*, Hal., and *Thrips frumentarius*, Beling, are certainly not responsible for the injury to cereals that is constantly ascribed to them. The author discusses four forms of injury to the stalks and ears of wheat that have been specifically attributed to thrips, but are really due to mechanical causes, chiefly wind.

EIDMANN (H.). **Die forstliche Bedeutung der roten Waldameise.** [The Forest Importance of the red Forest Ant.]—*Zeitschr. angew. Ent.*, xii, no. 2, pp. 298-331, 4 figs., 16 refs. Berlin, November 1926.

Of late years doubts have been cast on the economic usefulness in forestry of *Formica rufa*, L., probably because exact information on the bionomics of this ant has been lacking. As a result of a careful study made in German forests, which is described in detail, the following data have been obtained: The average annual food requirement of a

large colony of *F. rufa* (the size of which is not always indicated by the size of the ant-hill) amounts to several million insects, most of which are injurious species. Lepidopterous and Dipterous pupae are not recognised as living organisms by the ants and are therefore collected only when already injured. The hunting area of an ant-colony can cover up to about 17 acres, its extent depending on the character of the food available. The majority of the insects brought into the nest are overpowered when in a normal, healthy condition. Any damage done by *F. rufa* is quite without significance in forestry. Wherever the ant occurs in numbers in a forest it should be regarded as playing an important part in preventing the outbreaks of insect pests, and it should be specially protected.

MENZEL (R.). **Ueber Teeschädlinge in Niederländisch-Indien und ihre Bekämpfung. III.** *Euphorus helopeltidis* Ferrière (Hym. Braconidae) als Larvenparasit der Tee-Capside *Helopeltis antonii*, Sign. [On Tea Pests in the Dutch East Indies. III. *E. helopeltidis*, Ferrière, a Parasite of the Larvae of the Tea Capsid, *H. antonii*.]—*Zeitschr. angew. Ent.*, xii, no. 2, pp. 340–356, 18 figs., 21 refs. Berlin, November 1926.

Braconid parasites of the subfamily EUPHORINAE appear to have been hitherto only recorded from adult Coleoptera. *Euphorus helopeltidis*, Ferrière [*R.A.E.*, A, xiv, 591], which occurs in Java, seems to be the first species from the Indo-Malayan region, and is the first Hymenopterous parasite recorded from the tea Capsid, *Helopeltis antonii*, Sign. *Euphorus* (?) *nigricarpus*, Szép., has since been recorded from *H. bergrothi*, Reut., and *H. sanguineus*, Popp., on cotton in Nigeria [*R.A.E.*, A, xiv, 223]. The development and life-history of *E. helopeltidis* are described [cf. *R.A.E.*, A, xiv, 558]; hitherto no males have been observed. Newly-emerged females readily oviposit in young stages of *Helopeltis*. Incubation seems to take 4–5 days, the larval stage 14–24, and the pupal stage about 16. The parasitised nymphs of *Helopeltis* are very much weakened and are often unable to penetrate the leaf-tissues. The Ichneumonid hyperparasite, *Stictopisthus javensis*, Ferrière, appears to oviposit directly in the larva of *E. helopeltidis*; its practical importance is unknown.

*E. helopeltidis* has been observed to be fairly common in recent years; in some cases 50–80 per cent. of the Capsids were parasitised. Up to the present it has been found only on shaded tea plantations. When the parasite is noticed, only the older stages of *Helopeltis* are collected, so as to permit the development of the parasite in the younger ones.

WILLE (J.). *Curinus* (*Orcus*) *zonatus* Muls. (Coccinellidae), ein Feind der Schildläuse an Orangenbäumen. Beiträge zu seiner Morphologie, Biologie und bekämpfungstechnischen Bedeutung. [*C. zonatus*, an Enemy of Coccids on Orange Trees. Contributions to its Morphology, Biology and Importance in Control.] *Zeitschr. angew. Ent.*, xii, no. 2, pp. 357–375, 13 figs., 7 refs. Berlin, November 1926.

In southern Brazil, the Coccinellid, *Curinus zonatus*, Muls., is predacious on Coccids on orange and bamboo (a list of which is given).

The eggs are laid in batches of 5–10, and the egg-stage lasts about 15 days in June or July and 8 from November to March. The larval stage lasts 140 days and 51–53 days and the pupal stage 50 and 11 at the seasons named. The males live 30 and 21 days, and the females 35 and 27 days in the same periods. There are three generations a year. Each individual destroys about 30 Coccids, the adult being responsible for about half this total. The economic value of *C. zonatus* is greatly diminished owing to the enormous mortality in the egg-stage, and in the first larval instar in the case of the summer and autumn generations; this mortality is due to the great heat and moisture.

[MEIER (N. F.). MEYER (N. F.). **Ueber die Immunität einiger Raupen ihren Parasiten, den Schlupfwespen, gegenüber.** [On the Immunity of some Caterpillars in Relation to their Parasites.]—*Zeitschr. angew. Ent.*, xii, no. 2, pp. 376–384, 4 figs., 10 refs. Berlin, November 1926.

The information given here is substantially the same as that in an earlier paper [*R.A.E.*, A, xiv, 195] where the parasites of *Pieris* dealt with were *Apanteles glomeratus*, L., and *Anilastus ebeninus*, Grav. The latter is, however, here treated as a new species.

ZÖPPIG (F.). **Die Schädlinge und Krankheiten unserer Alpenveilchen (Zykamen) und ihre Bekämpfung.** [Pests and Diseases of Cyclamens and their Control.]—*Die kranke Pflanze*, iii, no. 11, pp. 202–205. Dresden, November 1926.

Cyclamens in greenhouses in Germany are attacked by Aphids, thrips, the larvae of an unidentified Noctuid and of *Polia (Mamestra) oleracea*, L., *Vanessa polychloros*, L., *Cheimatobia brumata*, L., and the weevil, *Otiorrhynchus sulcatus*, F.,. If the plants are not in flower, Aphids and thrips may be destroyed by dipping in a decoction of tobacco; otherwise the greenhouses should be fumigated with tobacco.

The other pests must be collected; the Noctuid larvae may be trapped in glasses baited with apple jelly, and the adults of the weevil in shelters made by putting down bundles of straw.

FRENTZEL-BEYME ( - ). **Ergebnisse systematischer Bodenuntersuchungen auf *Heterodera schachtii*, Schm.** [The Results of Systematic Soil Investigations regarding *H. schachtii*.]—*Zuckerrübenbau*, viii, 1926, pp. 12–14. (Abstract in *Zeitschr. Pflanzenkr.*, xxxvi, no. 11–12, pp. 361–362. Stuttgart, 1926.)

In sugar-beet fields cysts of the Nematode, *Heterodera schachtii*, Schm., occur as deep as 2 ft. Similar soils are not always equally infested, even if close together. The nature of the crop influences infestation very markedly, rye decreasing it by half within a year, and lucerne also reducing it near the surface.

DE KONING (M.). **De eikenspintkever** (*Eccoptogaster intricatus* Ratz.). [The Oak Cambium Beetle, *Scolytus intricatus*.]—*Tijdschr. Plantenziekten*, xxxii, no. 11, pp. 312-313. Wageningen, November 1926.

In Holland the adults of *Scolytus* (*Eccoptogaster*) *intricatus*, Ratz., appear in spring. The females bore mines about  $\frac{2}{5}$  in. long between the bast and the wood of oak and oviposit there. The larvae make mines up to 4 inches in length and pupate at the end of their galleries. There is a second flight in August.

THEOBALD (F. V.). **Entomological Department**.—[S.E. Agric. Coll.] *Ann. Rept. Res. & Adv. Dept. 1925-26*, pp. 5-22, 17 refs. [Wye, Kent, 1926.]

The larvae of *Phlyctaenia* (*Pionea*) *forficalis*, L., which were unusually abundant during the summer and autumn of 1925 and 1926, attacked cabbage, broccoli and cauliflowers. Numbers of the moths, which were found from mid-August to mid-September, were caught in light traps. Filberts [*Corylus avellana*] were severely attacked by two Tortricids, *Eucosma* (*Epiblema*) *penkleri*ana, F.R., and *Tortrix corylana*, F., the caterpillars of which destroyed the buds and young fruiting wood, and damaged the young leaves respectively. Larvae attacking the tops of peas and destroying the flowers and pods proved to be those of *Contarinia pisi*, Winn. (pea midge), which usually occur inside the pods. *Sitodiplosis mosellana*, Géhin, caused considerable damage to wheat, which was also slightly infested by *Contarinia tritici*, Kirby, while wheat and barley were seriously attacked by Tipulid larvae. The latter were successfully controlled by the use of a poison bait of 1 lb. Paris green and 20 lb. bran to the acre. *Rhynchites aquatus*, L., which attacked apples, has only once before been recorded doing this damage in England (1910). The eggs are laid in the young fruit, which is eaten by the larvae and the adults. The larvae of an Ortalid fly, *Myodina* (*Seoptera*) *vibrans*, L., caused considerable damage to the roots of vegetables and flowers during the winter and early spring, but were easily destroyed by hoeing naphthalene into the soil around the plants. *Pemphigus bursarius*, L. (*lactucarius*, Pass.) (poplar gall aphid) was again very prevalent [on lettuce]. *Myzus cerasi*, F. (cherry black fly) infested cherry orchards. Aphids bred by Miss F. M. Wimshurst from eggs found on *Galium palustre* in the spring were identical with *Myzus cerasi* (*asperulae*, Wlk.), and it is possible that this shows an alternate life-cycle of the Aphid.

Other fruit pests included: *Byturus tomentosus*, F., on raspberries and cultivated blackberries, 50 per cent. of the wild blackberries being infested in 1925; *Phyllobius oblongus*, L. (leaf weevil); *Perrisia pyri*, Bch. (pear leaf-curling midge); *Contarinia* (*Diplosis*) *pyrivor*a, Ril. (pear midge); *Thomasia* sp. (raspberry cane midge), of which only the parasitised larvae pass the winter in the canes, the healthy ones pupating in the soil (so that burning the canes does more harm than good, and a soil fumigant is suggested as a remedy); *Cydia pomonella*, L. (codling moth), which also occurred on pears; *Zeuzera pyrina*, L. (wood leopard), becoming more abundant in apple, pear and cherry; *Argyresthia nitidella*, F. (cherry fruit moth); *Blastodacna vinolentella*, H.S. (pith moth); *Anameson* (*Macrosiphum*) *rubicellum*, Theo., on loganberries, controlled by nicotine sprays and dusts; *Aphis idaci*, v.d.G. (raspberry aphid); *Anuraphis helichrysi*, Kalt.

(plum leaf-curl aphid); *Capitophorus ribis*, L., and *Aphis grossulariae*, Kalt. (currant Aphids); *Chlorita viridula*, Fall. (yellow leafhopper), on plums; *Psylla mali*, Schmidb. (apple-sucker); *Calocoris fulvomaculatus*, DeG., on currants; *Lecanium persicae*, F. (brown scale), on figs under glass; and *Eriophyes pyri*, Nal. (pear-leaf blister-mite).

The eggs of *Macrosiphum gei*, Koch (large green aphid), which occurred on hops, are laid on the bine before it is cleared up and on the stubs, the apterous individuals feeding as soon as the shoots appear; winged forms develop before the bine is half grown and fly away to various weeds. The other pests of hops were: *Myzus convolvuli*, Kalt.; *Hyphen rostralis*, L.; *Contarinia humuli*, Theo. (strig maggot); and *Phorodon humuli*, Schr. (hop aphid), which attacked the cone late in the year, causing a rusty red appearance.

Miscellaneous pests included: *Contarinia nasturtii*, Kieff. (swede midge); *Atomaria linearis*, Steph. (pigmy mangel beetle), on mangels and sugar-beet; *Aphis rumicis*, L., on mangels, pulses, and apple trees; *Cydia nigricana*, Sthp. (pea moth); *Tylenchus dipsaci*, Kühn (*devastatrix*, Kühn) on peas; *Limothrips (Thrips) cerealium*, Hal., on cereals; *Acidia heraclei*, L. (celery fly); *Psila rosae*, F. (carrot fly), against which powdered naphthalene was used with some success; *Pieris brassicae*, L., and *P. napi*, L., on vegetables; *Hepialus lupulinus*, L., attacking lettuce roots; *Lecanium capreae*, L. (brown scale), *Amphidasys betularia*, L. (pepper and salt moth) and Aphids, especially *Capitophorus rosarum*, Kalt., occurring on roses; *Aphelenchus ritsema-bosi*, Schwartz, on chrysanthemums both out of doors and under glass, and *Phytomyza (Agromyza) affinis*, Fall., on chrysanthemums under glass; and *Idiopterus nephrolepidis*, Davis (fern aphid).

A large colony of the parasite *Aphelinus mali*, Hald., which had been placed in a fruit plantation, increased and spread, but died out when *Eriosoma lanigerum*, Hausm., disappeared from some unknown cause. Another colony released in 1926 appears to have become established.

Observations on *Anuraphis roseus*, Baker, have been continued, but the alternate food-plants have not been found. The sexual forms of *A. crataegi*, Kalt., which curls apple leaves and produces a marked red-yellow colouration on them, appear in summer and oviposit on apple trees. *Rhopalosiphoninus ribesina*, v.d.G., an Aphid new to Britain, has been found on currants in Wales.

Apparently *Plesiocoris rugicollis*, Fall., on apples, cannot be completely controlled by spraying, but the numbers may be considerably reduced by grease-banding the trees and knocking off the Capsids with a force of water, when the nymphs crawling back get caught on the bands. If a nicotine spray is used instead of water, a number of Capsids are killed directly.

Experiments on the growing of pyrethrum are described, and it has been found that a French variety gives a better crop than a Japanese one.

An account of work done on gall-midges by H. F. Barnes is given in an appendix. Several of those dealt with are noticed in the body of the report. Others include *Dicerura kaltentachi*, Rübs. (iris midge), and *Contarinia lepidii*, Kieff., the larvae of which were found in galls on common cress (*Lepidium sativum*); these have not been previously recorded from the British Isles. Adults of *Diplosis humuli*, Theo. (strig maggot), originally described from the larva, which were successfully bred for the first time, were found to be identical with *Contarinia humuli*, Tölg.

DE JONG (W. H.). **Het voorspellen van insectenplagen.** [The Prediction of Insect Pest Outbreaks.]—*Tijdschr. Plantenziekten*, xxxii, no. 11, pp. 305–311. Wageningen, November 1926.

During observations on Tipulids in Holland it was possible to forecast accurately their occurrence, in five out of six years. The forecasts applied not only to *Tipula paludosa*, which is the species of chief economic importance, but also to *T. oleracea*, *T. maculata* and *T. vernalis*. As a rule the larvae attain a length of 1 cm. in November, and if at that time a count is made of them, it is possible to obtain a trustworthy estimate of the extent of infestation in the following spring. The larvae are, however, hard to find at this time of year, and it is therefore necessary to determine the abundance of adults present during the main flight-period and to note the weather at that time, though it does not have a decisive influence on mating and oviposition. The effect of periods of drought and the nature of the disease that destroys so many larvae are matters that require study.

In 1925 and 1926 peas in Holland suffered considerably from the attack of *Cydia* (*Grapholitha*) sp., *Phytophthora* sp., and *Cecidomyia* sp. As these all hibernate in the ground where peas have been grown in the preceding year, to predict their abundance, it is necessary to take soil samples from badly-infested fields in February, before peas are sown, and to compare the results with those of counts taken in previous years.

VECCHI (A.). **Ulteriori esperienze sull'alimentazione del Baco da seta con *Maclura aurantiaca*.** [Further Experiments on Feeding Silkworms on *M. aurantiaca*.]—*Boll. Soc. ent. ital.*, lviii, no. 8, pp. 122–130. Genoa, 30th October 1926.

Further experiments [*R.A.E.*, A, xi, 517] show that *Maclura aurantiaca* may be used for feeding the first two larval stages of *Bombyx mori*, as its effects disappear entirely or almost entirely if the subsequent stages are fed on mulberry leaves.

NONELL COMAS (J.) & DE LA HUERTA (A.). **Gusano de las manzanas y peras, *Carpocapsa pomonella* (Linneo).** [The Apple and Pear Worm, *Cydia pomonella*.]—*Estación Pat. veg.*, Divulgación no. 1, 13 pp., 4 figs. Barcelona, 1926.

This is a popular bulletin on the bionomics and control of the Tortricid moth, *Cydia* (*Carpocapsa*) *pomonella*, L. Even in the hottest regions of Spain there do not appear to be more than two generations a year, and in high-lying and cool districts the second generation is only a partial one. The first adults appear from April to June; those of the next generation from July to August.

NONELL COMAS (J.). **Gusano minador de los cereales, *Agriotes lineatus* (Linneo).** [The Larva Miner of Cereals, *A. lineatus*.]—*Estación Pat. veg.*, Divulgación no. 2, 7 pp., 3 figs. Barcelona, 1926.

In the province of Gerona, Spain, maize, tomato, tobacco, etc., are attacked by the larvae of *Agriotes lineatus*, L., and a popular account is given of the bionomics and control of this wireworm.

NONELL COMAS (J.). **Mosca del olivo, *Dacus oleae* (Gmel.).** [The Olive Fly, *D. oleae*.]—*Estación Pat. veg.*, Divulgación no. 3, 3rd edn., 15 pp., 1 fig. Barcelona, 1926.

In rainy years the Lotrionte method of poison-traps is the best method for combating *Dacus oleae*, Gmel., but in dry ones the Berlese method of spraying with a sweetened arsenical solution is more effective. A formula for the latter that has been found satisfactory consists of 5 oz. sodium arsenite and 22 lb. molasses or glucose in 22 gals. water. This, however, caused a slight scorching in some flowers of one variety of olive.

NONELL COMAS (J.). **La tiña del manzano y ciruelo.** [The Apple and Cherry Moths.]—*Estación Pat. veg.*, Divulgación no. 4, 15 pp., 2 pls., 4 figs. Barcelona, 1926. Also in *Bol. Agric. téc. econ.*, xviii, no. 215, pp. 549–563, 2 pls., 4 figs. Madrid, 30th November 1926.

In Spain the adults of *Hyponomeuta malinellus*, Zell. (apple moth) and *H. padellus*, L. (cherry moth) appear and oviposit in July. The caterpillars hatch in August and pupate in the following June. Before the fruits are formed, the caterpillars are best combated by sprays of barium chloride, of sodium arsenate and quicklime, or of sodium arsenate, lead acetate and slaked lime. When the webs have been spun, excellent results are given by a spray of 15 lb. pine resin, 2 lb. caustic soda, 2 gals. ammonia, and 100 gals. water. The Encyrtid, *Ageniaspis fuscicollis*, Dalm., parasitises the eggs of these moths and is an important factor in keeping them in check.

FALCOZ (L.). **Matériaux pour l'étude des larves de Curculionides.**—*Ann. Epiphyties*, xii, no. 3, pp. 109–129, 8 pls., 24 refs. Paris, 1926.

In spite of the economic importance of the Curculionids and the study that has been given to the habits of many species, the larval morphology has received very little attention. The work of previous authors has, however, demonstrated that, although apparently uniform, these larvae do show definite and constant generic and specific characters in their structure. The technique employed in the present study is explained, and the species of which the larvae and pupae are described are:—*Pachycerus* (*Cleonus*) *cordiger*, Germ., the larva of which forms galls on the roots of *Echium vulgare*; *Cyphocleonus* (*C.*) *tigrinus*, Panz., found on the roots of composites; *Bothynoderes* (*C.*) *mendicus*, Gyll., a pest of Chenopodiaceae, and sometimes injurious to cultivated beets; *Lixus punctiventris*, Boh., found in the stems of various composites; *Ceuthorrhynchus sulcicollis*, Payk., in the roots of various crucifers; *C. quercicola*, Payk., in *Fumaria officinalis*; and *Baris chlorizans*, Germ., in the lower part of the stem of many species of *Brassica*.

PICARD (F.). **Recherches sur la biologie de l'Altise de la vigne (*Haltica ampelophaga*, Guér.).**—*Ann. Epiphyties*, xii, no. 3, pp. 177–196, 11 refs. Paris, 1926.

An earlier account of this investigation on *Haltica ampelophaga*, Guér., has already been noticed [*R.A.É.*, A, ix, 208]. The phenomenon described as hibernation (which the author considers a misnomer) is

discussed at length. It is pointed out that *H. ampelophaga* enters hibernation during much warmer weather than that prevailing at its revival in April; therefore the usual supposition that hibernation is produced as a result of a drop in temperature is not tenable in this connection. Neither will Roubaud's classification of insects as homodynamic and heterodynamic according to their habits of hibernation [*R.A.E.*, B, xi, 55] meet the case, for it is not the last generation that hibernates but all individuals that are in the adult stage in September, and these may belong to any or all of the three generations. Evidently, then, the determining factor in hibernation is not internal but external, and must be some change in environmental conditions at the moment. Since temperature alone cannot cause the reaction, it is thought likely that conditions of nutrition may have some influence. In rearing cages, it was observed that all individuals of *H. ampelophaga* ceased feeding simultaneously, no doubt because the chemical composition of the leaf had changed. Possibly this cessation of feeding gives rise to all the other phenomena. It would be interesting to discover whether the activities of these autumn individuals can be prolonged, and feeding and oviposition continued, by maintaining them on fresh shoots obtained by special cultural processes. It is suggested that hibernation and aestivation are diapauses of an essentially similar nature and that the so-called hibernation of *H. ampelophaga*, which begins in September at a high temperature and ends in April during a lower one, is in all points comparable with the diapause of the apple-blossom weevil [*Anthonomus pomorum*, L.], which begins in May, continues throughout the summer and ends in March before the frosts are over. When hibernating individuals of *H. ampelophaga* were placed, in January, at a constant temperature of 71.6° F., on budding shoots of vines under glass, they became active and fed, but all died soon afterwards. It has not yet been determined whether the individuals that live through the winter became sexually mature only in the spring, or whether some of the females suspend oviposition in the autumn and resume in the following year.

Natural enemies of *H. ampelophaga* found in France include the fungus, *Beauveria globulifera*, the bug, *Zicrona coerulea*, L., and the Tachinid, *Degeeria funebris*, Mg.

MARCHAL (P.). **La lutte de l'homme contre l'insecte.**—*Vie agric. & rur.*, xxix, no. 47, pp. 328–329. Paris, 20th November 1926.

A popular account is given of the methods used in controlling insects, particularly the introduction of natural enemies, in which connection various instances are quoted.

BUISSON (E. M.). **Les données nouvelles sur le Phylloxera de la Vigne.** (*Phylloxera vastatrix*) **Lichten.-Balbani.**—*Rev. sci. bourbonnais*, 1926, no. 3, pp. 92–99, 10 figs. Moulins, October 1926.

This paper, which is an extract from the author's memoir, "Les Pucerons des arbres fruitiers," 1923, gives a summary of the knowledge regarding the various forms of the vine Phylloxera, *Phylloxera vastatrix*, Planch.

SERGEANT (E.) & ROUGEBIEF (H.). **Du mutualisme entre les Drosophiles (Dipt.) et les levures de vin.**—*Verh. III. Internat. Ent.-Kongr. Zürich, 1925*, ii, pp. 94–99. 1926.

In the course of further researches on the relation between Drosophilids and yeasts [*R.A.E.*, A, xii, 559; xiii, 297; xiv, 380] the authors have proved by experiment that no yeasts appear on grapes that are kept protected from *Drosophila*, and that there is, in fact, a constant relation between the process of fermentation and the development of Drosophilid eggs. It was also observed that moulds do not develop on grapes that have been visited by the insects.

In the discussion following this paper, F. W. Urich stated that in Trinidad Drosophilids are harmful rather than beneficial, as they sometimes set up bad fermentation in cacao by transmitting wild yeasts and also hasten decay in stored fruit.

SERGEANT (E.) & ROUGEBIEF (H.). **Des rapports entre les moucheron du genre Drosophile et les microbes du raisin. i. Mutualisme à l'égard des levures. ii. Antagonisme à l'égard des moisissures.**—*Ann. Inst. Pasteur*, xl, no. 11, pp. 901–921, 5 figs., 3 refs. Paris, November 1926.

This paper gives a detailed account of the researches in connection with Drosophilids and their relation to yeasts and moulds on grapes [see preceding paper].

GAUTIER (C.), BONNAMOUR (S.) & GAUMONT (L.). **Observations biologiques sur *Aphidius cardui*, Marsh. (Hym. Braconidae).**—*Bull. Soc. ent. France*, 1926, no. 15, p. 162. Paris, 1926.

The identity of *Aphidius cardui*, Marsh., parasitising a peach Aphid, now determined as *Aphis (Brachycaudus) amygdali*, Buckt., has been confirmed [*R.A.E.*, A, xiii, 368]. This parasite occurs in various localities in France and exercises considerable control. Its hosts include *Aphis grossulariae*, Kalt., *A. rumicis*, L. (*papaveris*, F.) and *A. saliceti*, Kalt.

DEMAISON (L.). **Sur l'abondance de la teigne des poireaux.**—*Bull. Soc. ent. France*, 1926, no. 16, p. 167. Paris, 1926.

In August and September 1925 the Tineid, *Acrolepia assectella*, Zell., caused considerable damage to leeks in the neighbourhood of Rheims. The caterpillars eat the leaves, penetrate the stems and kill the plants. In some cases as much as three-quarters of the crop was lost. Similar damage has been reported from central France.

STURGES (A. M.). **The Present Position regarding Adult Bee Disease in Great Britain.**—*Bee World*, viii, no. 6, pp. 82–86. London, November–December 1926.

A brief account is given of the chief diseases of bees that occur in Great Britain, especially those due to *Acarapis woodi* and *Nosema apis*, with notes on their treatment.

WILSON (G. F.). **Insect Visitors to Fruit Blossoms.**—*Jl. R. Hortic. Soc.*, li, pt. 2, pp. 225-251, 5 pls., 34 refs. London, November 1926.

The pollination of fruit trees by insects is discussed at length. Detailed observations show that many insects other than bees may act as pollinators.

THEOBALD (F. V.). **Insects caught in Light Traps.**—*Jl. R. Hortic. Soc.*, li, pt. 2, pp. 314-323, 3 pls. London, November 1926.

Experiments were carried out with light traps for two years to ascertain whether a sufficient quantity of male winter moths [*Cheimatobia brumata*, L.] could be caught to stop fertilisation of females, and whether Tortricids are attracted in large numbers. One Medusa acetylene light trap was used for nine months and two for fifteen. These were placed in a mixed fruit plantation consisting of apples, currants, nuts, and a few plums, and near pears, loganberries, American blackberries and strawberries. The traps failed as a means of catching male winter moths, but the numbers of Tortricids caught were large enough to warrant an extended trial.

The trays holding oil and water should be removed as soon after sunrise as possible, otherwise hive bees may be drowned in them. Water should not be used without oil or some of the moths caught may escape. The height of the lamp from the ground does not seem to affect the number of insects caught. Most moths are caught between sunset and one o'clock. General observations seem to show that one lamp to an acre is sufficient.

The length of time that some of the insects recorded are on the wing is shown to be much longer than is generally supposed, e.g., *Tortrix podana*, Scop., 25th June-31st August; *Abraxas grossulariata*, L., 24th July-2nd September; and *Tortrix rosana*, L., June-September.

The total number of insects caught in the two years was 9,977, of which 3,220 were definitely identified as pests, including 1,625 injurious Tortricids, 368 winter moths and 594 injurious Tipulids. Eight hundred other Tortricids were too badly damaged to be identified. Practically all moths caught from October to March were males, with the exception of *Diloba coeruleocephala*, L., of which 10 per cent. were pregnant females. During the summer, 45 per cent. of the Agrotine moths were females in one year, and only 7 per cent. in the other; 50 per cent. of the Tortricids, 45 per cent. of the Crambids, and 27 per cent. of the Tipulids were females. On several nights the oil in the trays was covered with the eggs of these insects. The plantation in which the traps were set was not badly attacked by any pests except sawflies, so that no large catches were expected.

The insects caught included very few beneficial ones. A list of the species is given, with tables showing the months in which they were caught. A light trap would probably only be of practical value during June, July and August; the cost of running one for this period is about 10s.

BARNES (H. F.). **The Gall Midges of Vegetables and Market Garden Crops.**—*Jl. R. Hortic. Soc.*, li, pt. 2, pp. 331-336, 4 pls., 6 refs. London, November 1926.

The life-history of *Contarinia nasturtii*, Kieff. (swede midge) is described [*R.A.E.*, A, iii, 500]. Two additional food-plants are marsh

watercress (*Radicula palustris*) and creeping watercress (*R. sylvestris*). The curling-over of the leaves effectually prevents any spray from reaching the insects feeding beneath. It has been suggested that a trap crop of vegetables should be planted round fields that had previously been planted with similar crops. A more satisfactory method would be to delay the sowing of the crop until the midges of the first brood have emerged and died without being able to lay their eggs, but care should be taken to see that there is no wild food-plant near.

The bionomics of *Perrisia brassicae*, Winn. (pod midge), which attacks numerous cruciferous crops, are given [*R.A.E.*, A, x, 262 ; xii, 25]. No remedy is yet known, but deep ploughing will destroy overwintering larvae. It has been found that when summer crops of rape are grown immediately after winter crops there is a great increase of the midge. Additional food-plants are swedes and beets.

*Perrisia raphanistri*, Kieff. (colza flower midge) attacks the flowers of a great number of crucifers, such as cabbages, turnips, radishes and colza. Several of the larvae live together in the flower, causing deformation, which prevents the normal development of the seed. There are at least two generations a year, in spring and summer, the latter generation remaining throughout the winter in the soil. The midge is not usually present in large enough numbers to do much damage, and no control measures have yet been recorded.

*Contarinia pisi*, Winn. (pea midge) lays its eggs in June in pods of peas ; less often in those of beans. The larvae usually live together in batches of 20-40 and feed, apparently, on the inner part of the pod, producing a curious swollen deformity of the pods, and stunting their growth. As many as 300 may be found in one pod ; they may also be found among shelled peas and thus lower their market value. Other workers have stated that the life-cycle takes about four weeks ; that adults have been obtained in July ; and that the winter is passed in the adult stage. In the author's observations, however, the winter was passed in the pupal stage in the soil. In the south of England at least, early peas are seldom infested, the main crops being most heavily attacked. The larvae of a predacious midge have been found attacking larvae of *C. pisi* in Kent. All infested plants should be burnt as soon as the crop is gathered, and the land should be trenched and rolled in the autumn and winter, and only top-worked in the following spring.

The larvae of *Pezomyia speyeri*, Barnes (mushroom midge), which are not gregarious, feed on the mycelium of mushrooms grown under glass. The pupae may be found a little below the surface of the mushroom bed. This midge has not been known to occur in sufficient numbers to be regarded as a serious pest.

*Perrisia bryoniae*, Bch., which is a pest of vegetable marrow in France, occurs in Great Britain on white bryony (*Bryonia dioica*). Several of the larvae live together in clusters of malformed leaves at the extremities of the shoots, which they deform. They are in the shoots in June and July ; the pupal stage lasts about 8-14 days, and the adults emerge in July. There is probably another generation in the late summer and autumn, which pupates in the soil during the winter months.

*Kiefferia pimpinellae*, Lw., and *Macrolabis corrugans*, Lw., are pests of parsnips in France, but although they are fairly common in Britain on wild umbellifers, and have been recorded on parsnips, they have not yet become pests. The larvae of both these midges pupate in the soil. A list of their food-plants is given.

FRYER (J. C. F.) & STENTON (R.). **Pyrethrum-growing for Insecticidal Purposes.**—*Jl. Minist. Agric.*, xxxiii, no. 10, pp. 916-920, 2 pls. London, January 1927.

The properties of pyrethrum as an insecticide are discussed, and a brief history of its cultivation is given. Preliminary experiments on pyrethrum-growing in England have been made, and the results have been successful enough to warrant their continuation.

MILES (H. W.) & PETHERBRIDGE (F. R.). **The Control of Wireworms in Glasshouses.**—*Jl. Minist. Agric.*, xxxiii, no. 10, pp. 931-939. London, January 1927.

Owing to the increase of the tomato-growing industry in the British Isles, much new grass land is being enclosed, and considerable losses may occur through damage by wireworms. Experiments were carried out to determine whether the method of using baits and soil insecticides, which has given effective control in America, could be employed in this country.

The following is taken from the authors' general conclusions: Wireworms (*Agriotes obscurus*, L., and other species) are readily attracted to suitable bait substances, and out of a number of baits selected for trial germinating wheat has proved by far the most efficient. Drilled in rows 2 to 4 ft. apart, wheat attracts a considerable proportion of the available wireworms in a fortnight to three weeks, depending largely on soil temperature. Granular calcium cyanide [*R.A.E.*, A, xiv, 444], used at the rate of from  $1\frac{1}{2}$ – $3\frac{1}{2}$  lb. to 180 ft., in conjunction with a suitable system of baiting, yields a good measure of control. Results obtained in these experiments indicate that the finer the soil the more effective the treatment, and the nearer the middle of the bait rows the calcium cyanide is deposited the higher the mortality amongst the assembled wireworms.

TITSCHACK (E.). **Untersuchungen über das Wachstum, den Nahrungsverbrauch und die Eierzeugung. II. *Tineola biselliella* Hum. Gleichzeitig ein Beitrag zur Klärung der Insektenhäutung.** [Investigation as to Growth, Food-consumption and Egg-production. II. *T. biselliella*. Together with a Contribution to the Elucidation of Insect Moulting.]—*Zs. wiss. Zool.*, cxxviii, no. 3-4, pp. 509-569, 2 figs., 62 refs. Leipzig, 18th October 1926.

This is a detailed study on the effects of insufficient or unsuitable food on the development and number of moults of the larvae of *Tineola biselliella*, Hum. (clothes moth), and on the resulting adults and their fertility.

BAUNACKE (—). **Der Pflanzenschutzdienst im Freistaate Sachsen und seine Bedeutung für Pflanzenschutzmittelindustrie, Pflanzenschutzmittelhandel und Pflanzenbau.** [The Plant Protection Service in Saxony and its Importance to the Industry of and Trade in Fungicides and Insecticides and to Agriculture.]—*Die kranke Pflanze*, iii, no. 12, pp. 213-228. Dresden, December 1926.

The duties of the government plant protection service in Saxony include the inspection of crops, the diffusion of knowledge regarding

diseases and pests of plants, the testing of apparatus and materials used in plant protection, the loan of such apparatus, and the sale of approved materials, the lists of which are constantly revised.

REYNE (A.). **Onderzoekingen over de monddeelen der Thysanoptera.** [Investigations on the Mouth-parts of the Thysanoptera.]—111 pp., 5 pls., 113 refs. Utrecht, 1926.

The contents of this extensive thesis are indicated by its title.

PRIESNER (H.). **Die Thysanopteren Europas. II. Teil.** pp. 239–344, 1 pl. Vienna, Fritz Wagner, 1926. Price M. 16.

The first part of this treatise has been noticed [*R.A.E.*, A, xiv, 308]. The main section on specific morphology and classification is continued here. Two new species and four new varieties are described.

S[CHENK] (P. J.). **Plagen van Chrysanten.** [Pests of Chrysanthemums.]—*Floralia*, xlvii, no. 48, pp. 754–755, 2 figs. Assen, 3rd December 1926.

In Holland chrysanthemums are attacked by the Nematode, *Aphelenchus olesistus*, which is found in the leaves and stems, causing them to wither. Slips should only be cut from healthy plants and planted in unfested soil, and the plants should be kept dry. The females of the fly, *Phytomyza chrysanthemi*, suck the sap of the leaves. They live for 4–6 weeks and each deposits about 150 eggs in the leaves, which are then mined by the larvae. Some nine generations can occur in a summer. Infested leaves should be picked in spring and burned; badly infested plants must be completely destroyed. These measures must be extended to the other plants such as *Helianthus*, *Cineraria*, etc., infested by this fly.

FERRIÈRE (C.). **Notes sur les Chalcidiens de la Suisse. 1. De quelques Trichogrammidés.** *Schweiz. ent. Anz.*, v, no. 6, pp. 2–4. Zürich, 1st June 1926.

The egg-parasites recorded from Switzerland include *Ophioneurus signatus*, Ratz., from *Rhynchites conicus*, Ill., and *Centrobia walkeri*, Först., from *Leucaspis pini*, Hart.

[VUKASOVIĆ] VOUKASSOVITCH (P.). **Observations biologiques sur les parasites de la Piéride du chou (*Pieris brassicae*, L.).** —*Rev. Zool. agric. & appl.*, xxv, nos. 6–9, pp. 81–90, 103–108, 113–121 & 134–140, 8 figs., 16 refs. Bordeaux, June–September 1926. [Recd. December 1926.]

Following the lines of investigations in France [*R.A.E.*, A, x, 359], the author has made a similar study of the parasites of *Pieris brassicae*, L., in Serbia. He finds that practically the same parasites and hyperparasites occur there as those discovered by Picard in France and by Martelli in Italy. All the following were found in the vicinity of Belgrade: the egg parasite, *Trichogramma evanescens*, Westw.; the larval parasites, *Anilastus ebeninus*, Grav., *Apanteles glomeratus*, L., and *Compsilura concinnata*, Mg.; and the pupal parasites, *Pimpla*

*instigator*, F., and *Pteromalus puparum*, L. Notes on the biology and interrelations of these parasites as occurring in Serbia are given. The action of any one of them taken singly was weak throughout the summer, but their combined effect was of considerable importance. The degree of parasitism of *A. glomeratus*, which is generally the commonest and most exclusive parasite of *P. brassicae*, was not more than 1–2 per cent., and even the action of this small number was limited by hyperparasitism by *Tetrastichus rapo*, Wlk. From 20 to 25 per cent. of larvae were killed by *Anilastus ebeninus*, but this parasite also is attacked by *T. rapo*. *Trichogramma evanescens* probably killed about 20 to 25 per cent. of the eggs. All these parasites have a much greater effect on the second generation than on the first. In the autumn, different species of parasites began to appear, including *C. concinnata*, *Pimpla instigator* and *Pteromalus puparum*; the last of these was by far the most active and had parasitised as many as 98 per cent. of the pupae collected at the end of September; this was probably, however, an unusually high percentage.

[SAKHAROV (N.).] Сахаров (Н.). Considerations involved in the Study of Injurious Insects in the Lower Volga Region. [In Russian.]—*Nizhnee Povolzh'e*, 1926, no. 2–3, reprint, 18 pp., 12 refs.

This is a discussion of various environmental factors affecting insect pests in general, and of the groups of pests in the Volga region of which a study is desirable.

VAYSSIÈRE (P.). Les Acridiens migrants en Afrique nord-équatoriale.—*C.R. Soc. Biogéogr.*, iii, no. 21, pp. 34–36, 3 refs. Paris, 1926.

*Schistocerca gregaria*, Forsk., which has apparently not occurred in French West Africa since 1918, nor in the Anglo-Egyptian Sudan since 1916, has of late been observed in these regions, as has *Anacridium moestum melanorhodon*, Wlk., which has recently been recorded, to the exclusion of all other locusts, from some districts.

EGGERS (H.). Ipidæ aus Birma.—*Acta ent. Mus. Nat. Pragæ*, iii, no. 21, pp. 151–160. Prague, 1925. [Recd. December 1926.]

This list of 64 Scolytids occurring in Burma includes descriptions of the new species, *Sphaerotrypes helferi*, *Kissophagus curtus*, *Phlocosinus similis*, *Cryphalus birmanus*, *Stephanoderes hispidus*, *Dryocoetes ater*, *Thamnurgides rugicollis*, *Pseudothamnurgus praeruptus*, *Xyleborus angustior*, and *X. pseudovalidus*. *C. proximus*, sp. n., is described from Mysore.

OCFEMIA (G. O.). Progress Report on Bunchy-top of Abaca or Manila Hemp.—*Phytopathology*, xvi, no. 11, p. 894, 1 ref. Lancaster, Pa., November 1926.

Experiments with *Pentalonia nigronervosa*, Coq., as a vector indicate that bunchy-top of *Musa textilis* (Manila hemp) in the Philippines may be transmitted from diseased to healthy plants by this Aphid.

NAKAYAMA (S.). **On *Sinoxylon anale* Lesne.** [*In Japanese.*]—*Kontyu*, i, no. 2, pp. 101–103. Tokyo, 1926.

The Bostrychid, *Sinoxylon anale*, Lesne, which has not been previously recorded from Japan, was recently found at Yokkaichi, having probably been imported from India with bamboo.

ONOE (T.). **Lead Arsenate and its Poisonous Effects (II).** [*In Japanese.*]—*Kontyu*, i, no. 2, pp. 104–107. Tokyo, 1926.

This is a continuation of a previous paper [*R.A.E.*, A, xiv, 430].

NAKAYAMA (S.). **On *Lecanium oleae* Bernard (Coccidae).** [*In Japanese.*]—*Jl. Plant Prot.*, xiii, no. 11, pp. 662–666. Tokyo, November 1926.

*Saissetia (Lecanium) oleae*, Bern., is sometimes found on imported plants at the quarantine stations at Kobe and Yokohama, but it has only twice been recorded in Japan, and seems to have died out.

EGUCHI (M.). **Studies on *Zinckenia fasciata* Cramer (Pyralidae), a Pest of the Sugar-beet.** [*In Japanese.*]—*Agric. Expt. Sta. Korea*, Spec. Rept. no. 2, pp. 1–23, 4 pls. Suigen, Korea, May 1926. (With a Summary in English.)

*Zinckenia fasciata*, Cram., is widely distributed in Japan and has been known as a pest of sugar-beet since this crop was first cultivated in 1906. It causes very serious damage, especially from the middle of August to the end of September. There are 3 or 4 generations a year, hibernation taking place in the pupal stage; the life-cycle occupies 22 or 23 days in summer and about 30 in autumn, the duration of the various stages being: egg 2–7 days; larva 7–20 days; pupa 7–15 days. The adults live for 7–10 days. The eggs are laid singly at night on the lower surface of the leaves along the veins, and a female can deposit about 300 in summer, or 150 in autumn. The larvae feed on the lower sides of the leaves of about 15 species of plants, but show a decided preference for Amarantaceae and Chenopodiaceae. Pupation occurs in the soil.

The larvae are attacked in the field by an Ichneumonid, a Muscid, a Nematode, two species of Carabids, various birds, etc. Hand-picking is recommended, and of the insecticides tested lead arsenate and pyrethrum were comparatively effective.

KUWANA (I.) & TANAKA (K.). **On *Ocneria fulva* Leech (Lymantriidae), a Pest of *Juniperus chinensis*.** [*In Japanese.*]—*Kontyu*, i, no. 2, pp. 71–82, 1 pl. Tokyo, 1926.

The larvae of the Lymantriid, *Ocneria fulva*, Leech, feed on the leaves of *Juniperus chinensis*, and, less readily, on *J. procumbens*. In captivity they will also attack *Thujopsis dolabrata*. There are two generations a year, hibernation taking place in the egg and larval stages. The adults appear from late June to early July and again in the autumn. The eggs are deposited on the leaves or branches, one female laying about 42 eggs in 2 or 3 masses during life. The males live for an average of  $6\frac{1}{2}$  days and the females for  $7\frac{1}{2}$ . The egg stage lasts about 17 days,

and the larval stage about 50, or 230 in the case of hibernating larvae. Pupation may occur on the branches, and the adults emerge 9–17 days later. The larvae are attacked by a Dipterous parasite, the adults of which appear in early June.

GIRAULT (A. A.). **Two New Parasites of Bug Eggs (Hymenoptera).**—*Insecutor Inscitiae Menstruus*, xiv, no. 7–9, pp. 137–138. Washington, D.C., 8th November 1926.

The Proctotrupids, *Telenomus biproruli*, sp. n., and *T. glabriscrobus*, sp. n., reared from the eggs of *Biprorulus bibax*, Bredd., in Queensland, are described.

The host of *Hadronotus hirsutioculus*, Gir. [*R.A.E.*, A, xiii, 610] was the Coreid, *Aulacosternum nigrorubrum*, Dal., not the Pentatomid, *Tectocoris lineola*, F., as stated.

GIRAULT (A. A.). **Correction.**—*Insecutor Inscitiae Menstruus*, xiv, no. 7–9, p. 140. Washington, D. C., 8th November 1926.

According to J. D. Hood the correct name for the thrips causing banana rust in Queensland is *Anaphothrips signipennis*, Bagn., originally described from Ceylon, of which *Euthrips biguttaticorpus*, Gir., is a synonym [*R.A.E.*, A, xiii, 284, 453].

KELLY (R.). **Australian Thrips.**—*Vict. Nat.*, xliii, no. 6, p. 188. Melbourne, 5th October 1926.

While most of the Thysanoptera in Australia are endemic, there are some introduced species, such as *Limothrips cerealium*, Hal., which the author has taken on wheat. Records, received from A. A. Girault, are given for the first time in Australia of another grain thrips, *Chirothrips manicatus*, Hal., and of *Pseudanaphothrips achactus*, Bagn., in various districts in Queensland, on cultivated and introduced plants.

PUTTEMANS (A.). **O “mosaico” da canna de assucar.** [Sugar-cane Mosaic.]—*Bol. Minist. Agric. Ind. e Comm.*, xv (ii), no. 3, pp. 350–355. Rio de Janeiro, September 1926. [Recd. December 1926.]

In Brazil *Aphis maidis* does not seem to be the vector of sugar-cane mosaic, for only two individuals of an undetermined species of *Aphis* were noticed in all the cane-fields examined during a period of months. Nor did the mealybug, *Pseudococcus boninsis (calceolariac)*, seem responsible, although it was abundant in the infested fields. In the early stages of the disease the spots were confined to the young leaves, and an examination of the latter revealed the presence in large numbers of the larvae of *Thrips [minuta var. puttemansi, Costa Lima, R.A.E., A, xiv, 500]*. Two views are put forward, one, that this thrips inoculates the mosaic virus, and the other that the thrips is the sole cause of symptoms that resemble those of true sugar-cane mosaic. New infections may be supposed to be due to thrips that have migrated from neighbouring plants or perhaps to larvae hidden in the slips used for seed. This insect has, however, been found in abundance in fields free from mosaic.

DE AZEVEDO MARQUES (L. A.). **Pragas do Algodoeiro. I.** [Cotton Pests. I.]—*Bol. Minist. Agric. Ind. e Comm.*, xv (ii), no. 3, pp. 356–358, 1 fig. Rio de Janeiro, September 1926. [Recd. December 1926.]

Cotton plants in the Brazilian State of S. Paulo are attacked by the larva of a weevil, *Gasterocercodes gossypii*, Pierce, which mines the roots and stem [cf. *R.A.E.*, A, xiv, 238].

MACHADO (J. B.). **Pro combate ás saúvas. Efficacia real dos gazes venenosos.** [Work against Leaf-cutting Ants. The real Efficiency of poisonous Gases.]—*Chacaras e Quintaes*, xxxiv, no. 5, pp. 447–448. S. Paulo, 15th November 1926.

A mixture that has proved successful for fumigating the nests of leaf-cutting ants [*Atta*] in Brazil is made of powdered white arsenic 1 lb., flowers of sulphur 1 lb., and powdered wood charcoal 1 lb. A packet containing  $\frac{1}{4}$  lb. of the mixture is used for each nest; it is burned with the help of glowing wood embers in the combustion chamber of a fumigator fitted with a fan that drives the gases into the subterranean galleries.

RINGUELET (E. J.). **Contribución al Estudio de la *Pulvinaria flavescens* Brèthes.** [Contribution to the Study of *P. flavescens*.]—*Ann. Soc. cient. Argentina*, xcvii, no. 1–4, pp. 61–80, 16 figs., 16 refs. Buenos Aires, January–April 1924. [Recd. November 1926.]

*Pulvinaria flavescens*, Brèthes, lives on the lower surface of the leaves of *Citrus* in La Plata. These curl up, and in bad infestations the young shoots may be almost covered by the scale, though Hymenopterous parasites generally keep it in check. A saphrophitic fungus, *Macrosporium comune*, is found in association with the larvae, but only on dead individuals. The pest is distributed by birds. The various stages of it and the alteration in the leaf tissue caused by it are described.

**The Surinam Toad** (*Bufo aqua*).—*Agric. Notes, Porto Rico Agric. Expt. Sta.*, no. 26, p. 2. San Juan, P.R., April 1926. [Recd. November 1926.]

The Surinam toad (*Bufo aqua*) has been imported into Porto Rico from Barbados for the control of certain nocturnal insect pests such as *Lachnosterna*, mole-cricket [*Scapteriscus vicinus*, Scud.] and cockroaches. It has increased and spread rapidly in the western end of the island, and is now being introduced into other parts. In three months a single toad will eat nearly 10,000 injurious insects, which constitute 88 per cent. of its food.

ROSS (W. A.). **Lubricating Oil Sprays with Special Reference to their Use on Pear Psylla.**—*57th Ann. Rept. Fruit Growers' Assoc. Ontario, 1925*, pp. 77–81. Toronto, 1926.

In this popular version of a paper that has been noticed elsewhere [*R.A.E.*, A, xv, 36] particular stress is laid on the necessity for very thorough application of 3 per cent. lubricating oil sprays for the control of the pear psylla [*Psylla pyricola*, Först.]; this can be done economically, as the cost is less than a quarter that of spraying with lime-sulphur or nicotine sulphate, being about 4s. for 100 gals. of diluted spray.

ROSS (W. A.). **The Oriental Peach Moth Situation in the Niagara District.**—*57th Ann. Rept. Fruit Growers' Assoc. Ontario, 1925*, pp. 81-83. Toronto, 1926.

The infestation of peaches by the oriental peach moth [*Cydia molesta*, Busck] in the Niagara district of Ontario [R.A.E., A, xv, 34] is at present very slight, and it is suggested that it may be possible to prevent it from becoming serious, for some years at least, by thorough cultivation of the soil in peach orchards, not later than 1st May, in order to destroy the hibernating larvae, and by the destruction of all damaged peaches, which can be either given to pigs or buried in deep pits.

CARDINELL (H. A.). **Methods of applying Spray Materials to Fruit Trees.**—*57th Ann. Rept. Fruit Growers' Assoc. Ontario, 1925*, pp. 90-93. Toronto, 1926.

Tests of different methods of applying sprays to apple trees attacked by codling moth [*Cydia pomonella*, L.], Aphids and apple scab [*Venturia inaequalis*] in Michigan in 1924 and 1925, showed that, with a pressure of 305-310 lb. to the square inch, spraying the trees throughout the season from the inside as well as from the outside was unnecessary, and that one man could work as rapidly and efficiently as two. In 1924 old trees were sprayed, and the percentage of undamaged apples varied from 63 to 67 on the sprayed plots, as compared with 4 per cent. on the control plot. In 1925 young trees were sprayed, and the percentage of undamaged apples varied from 79 to 86. When the trees were sprayed on one side only at each application, with the wind, the time taken and quantity of spray applied were almost twice as great as when each tree was sprayed separately and completely in one application.

LYNE (W. H.). **Report of Inspector of Imported and Exported Horticultural and Field Products.**—*Br. Columbia: 20th Ann. Rept. Dept. Agric., 1925*, pp. 26-30. Victoria, B.C., 1926.

Pests intercepted in plants and plant products imported into British Columbia during 1925 included, in addition to others that have also occurred in recent years [R.A.E., A, ix, 13, 583; x, 126; xiv, 44], larvae of cherry fruit-flies [*Rhagoletis*] in cherries and Aphids on the roots of peach trees, from the United States, and *Lecanium capreae*, L., on ornamental shrubs from Europe.

RUHMANN (M. H.). **Report of Assistant Entomologist, Vernon.**—*Br. Columbia: 20th Ann. Rept. Dept. Agric., 1925*, pp. 33-36. Victoria, B.C., 1926.

The situation with regard to *Cydia pomonella*, L. (codling moth) is discussed [cf. R.A.E., A, xiii, 52], and it is concluded that it will eventually spread to all the apple-growing areas of British Columbia, whatever measures are taken. In order to find a means of eliminating the costly procedure of inspecting shelter bands on apple trees for the destruction of pupae of *C. pomonella*, experiments were made to test the efficacy of bands of wire-netting, 12 meshes to the inch, in preventing the emergence of the moths from the burlap bands when placed over them. This method was tested on 94 trees, and it appeared that all

larvae that left the fruit on these trees made their way through the wire meshes and pupated under the bands, but that no adults succeeded in emerging through the wire. It is possible, however, that some moths might escape through the meshes immediately on emergence from their cocoons, before their wings were dry; this point will be investigated. The cost of applying wire traps over the burlap bands amounted to about 9d. for each tree, for material and labour, but they would last for a number of years, and could probably be produced more cheaply if used in sufficient numbers.

The existence of a small infestation of *Rhagoletis fausta*, O.S. (cherry fruit-fly) in cherries in one district has been confirmed. The outbreak of *Malacosoma disstria*, Hb. (forest tent caterpillar) reached its peak in 1925, but parasites were so abundant that they almost exterminated it, and it is expected that this pest will be very little in evidence for some time in the areas in which it has been troublesome for several years. *Aspidiotus perniciosus*, Comst. (San José scale) [*R.A.E.*, A, xiv, 44] appears to be well under control. *Phytomyza chrysanthemi*, Kow. (chrysanthemum leaf-miner) caused considerable damage under glass, but was controlled with nicotine solutions. Light infestations of *Eriosoma (Schizoneura) lanigerum*, Hausm. (woolly apple aphid) on apple were completely controlled by calcium cyanide, A and B dusts [*R.A.E.*, A, xiv, 74], applied with a hand blower in the early stages of infestation, before the colonies had become scattered through the tops of the trees. Calcium cyanide, grades A and G [*R.A.E.*, A, xiv, 444], gave excellent results in fumigating greenhouses, at the rate of  $\frac{1}{4}$  oz. to 1,000 cu. ft. of space.

EWING (H. E.). **Wing Production in Plant Lice.**—*Amer. Nat.*, lx, no. 671, pp. 576–578, 11 refs. Garrison, N.Y., November–December 1926.

Reference is made to the work of other authors on the subject of wing production in Aphids, and attention is called to the analogy between the production of functional wings in asexual Aphids and the abnormal production of wing-pads in certain insect larvae, a process termed prothetely. This occurs more frequently in the larvae of Coleoptera than in those of other orders and has been supposed to be induced by sudden or violent changes in environment, particularly temperature.

BILSING (S. W.). **The Life History and Control of the Pecan Nut Case Bearer** (*Acrobasis caryae*, Grote).—*Texas Agric. Expt. Sta.*, Bull. 328, 77 pp., 25 figs., College Station, Texas, April 1926. [Recd. November 1926.]

This bulletin presents a full account of experiments and observations made from 1918 to 1923 on the life-history and control of the pecan nut case-bearer in Texas. There is some doubt as to the identity of this Pyralid; in previous papers [*R.A.E.*, A, ix, 350; xiii, 254], in which much of the more important information included in the present bulletin was given, the author recorded it as *Acrobasis caryiworella*, Rag., but he now considers that it is probably *A. caryae*, Grt. The larvae feed on *Carya (Hicoria) pecan*, and, so far as is known, have no other food-plant. The adult, egg, larva and pupa, and the technique employed in rearing the moths are described. The adults remain

motionless on the trees during the day and are well concealed by their protective colouration; they fly at night and are attracted to diffused light but repelled by a strong one. The dependence of the number of generations produced in a year upon the size of the pecan crop is discussed; it appears that when more than 20 per cent. of a full crop of nuts matures there are four generations, and when less than this there are only two. Other factors may, however, play some part in determining the number of generations. The females of the spring brood produced by the hibernating larvae lay eggs from the end of April to the end of May, usually singly in the tip of the pistil or on the calyx, and occasionally on the sides of the nuts. The larvae of the first generation, which hatch from these eggs, feed for 1-2 days on the buds and then enter the nuts, within which they continue to feed; they then pupate, producing adults that emerge from the beginning of June to the beginning of July. The females of the first generation oviposit in grooves near the bases or tips of the nuts or on the buds; the feeding habits of the larvae of the second generation are the same as those of the first, and the adults emerge from the end of July to the end of August. The females of the second and third generations oviposit in the same positions as those of the first; the larvae of the third generation sometimes enter the nuts, but usually feed and pupate in the husks, producing adults from the third week in September to the middle of October; some of the larvae of this generation feed for a few days and then spin hibernacula. The larvae of the fourth generation feed for a few days in the husks or at the bases of the buds or petioles, and then spin hibernacula, the latest date observed for this being 10th November.

Spraying with 3 lb. lead arsenate to 50 U.S. gals. water was the most effective control measure; this should be done 8-10 days after the appearance of numbers of moths of the spring brood, the date of which should be determined, if possible, by collecting larvae and pupae; usually it is shortly after the nuts have set. If it is not practicable to rear moths, watch should be kept for the first signs of damage to the buds by the larvae of the first generation, the object being to spray just before the hatching of the majority of the larvae. A second spray should be applied 7-10 days after the first, and if the infestation is severe, a third application should be made 7-10 days after the second. Sprays are uneconomic if the infestation is less than 8-10 per cent. The trees should be thoroughly drenched with spray. Under favourable conditions 85 per cent. control has been obtained, but if heavy rains fall just after spraying, and it is impossible to spray again without delay, the whole crop may be lost. It has not been found practicable to spray except to control the first generation larvae; spraying in the early spring with a contact poison to kill the larvae in their hibernacula would be desirable, but no insecticide suitable for this purpose has yet been found, although oil emulsions show some promise.

POPENOE (C. H.). **Thallium as an Insecticide.**—*Science*, lxiv, no. 1665, p. 525, 2 refs. Garrison, N.Y., 26th November 1926.

Recent experiments indicate that thallium sulphate, though at present too costly to be used on a large scale, has a limited field in the control of ants in houses. *Monomorium pharaonis*, L., which is not controlled by arsenic syrups, has been exterminated in a number of dwellings within 3-4 weeks by a bait consisting of 1 U.S. pt. water, 1 lb.

sugar, 27 grains thallium sulphate and 3 oz. honey, the whole being brought to the boil and thoroughly stirred. The thallium appears to act as a slow cumulative poison, the ants continuing to feed on it until the whole colony is destroyed. *Tetramorium caespitum*, L., is even more readily controlled, and several other species have shown themselves to be susceptible to it. The value of this poison on other insects is being tested.

**Bureau of Plant Industry : Entomology Section.** [Annual Report for 1925.]—*Pennsylvania Dept. Agric.*, Gen. Bull. 427, pp. 47–56, 5 figs. Harrisburg, Pa., 1st May 1926. [Recd. November 1926.]

This report contains brief statements of the control and inspection work carried out in connection with the principal insect pests in Pennsylvania in 1925. The extension of the area infested by the Japanese beetle [*Popillia japonica*, Newm.] in the State was proportionately the smallest since its first appearance, the total infested area being 1,800 square miles at the end of 1925; an extremely dense flight of the beetles occurred from 10th to 14th July, and the movement of farm products from Philadelphia market was prohibited during that time. A great increase took place in the area and intensity of infestation by the European corn borer [*Pyrausta nubilalis*, Hb.] in the north-eastern part of the State, over 9,800 square miles being infested in 1925 as compared with 2,000 in 1924; this was probably due to favourable climatic conditions coupled with extensive flights of moths across the lakes from Ontario. The degree of infestation in parts of Pennsylvania amounted to one larva to a stalk, and it is possible for such an infestation to increase more than a hundredfold in one year. The oriental peach moth [*Cydia molesta*, Busck] occurs throughout south-eastern Pennsylvania, and was found in one nursery in the western part of the State; the infestation during 1925 was about 10 per cent. in early peaches and nearly 100 per cent. in late peaches. The Mexican bean beetle [*Epilachna corrupta*, Muls.] in the south-western part of the State, was found over an area extending about 20 miles eastward from that occupied by it in 1924. Nursery inspection work resulted in the discovery and destruction of the leopard moth [*Zeuzera pyrina*, L.] and egg masses of the gipsy moth [*Porthetria dispar*, L.], neither of which pests is yet established in the State.

VAN LEEUWEN (E. R.). U.S. Bur. Ent. **Sprays for the Japanese Beetle.**—*Pennsylvania Dept. Agric.*, Gen. Bull. 406, 8 pp., 5 figs. Harrisburg, Pa., June 1925. [Recd. December 1926.]

The sprays here recommended for the control of the Japanese beetle, *Popillia japonica*, Newm., have been noticed elsewhere [*R.A.E.*, A, xiv, 156]. In spraying trees to protect them from injury, thoroughness is essential, and it is especially necessary to spray the upper branches, as these are attacked first, and once a few beetles are established on them they may attract others. It is not advisable to spray cherries before the fruit is picked, but if the beetles are very injurious, 1½ lb. lead arsenate and 2 lb. flour to 50 U.S. gals. water may be used. Some protection is afforded to early peaches by thorough applications of lead arsenate to the surrounding trees, if this spray is not injurious to them, such applications having a tendency to prevent *P. japonica* from congregating in the particular area.

ALLEN (H. W.). **Observations upon the Early Maggot Stage of *Linnaemyia comta* Fall. (Diptera : Tachinidae).**—*Ent. News*, xxxvii, no. 9, pp. 283-286, 1 fig., 6 refs. Philadelphia, Pa., November 1926.

*Linnaemyia comta*, Fall., is widely distributed in Europe and occurs from southern Canada to Central America. It is parasitic on a number of Noctuid larvae, including *Agrotis ypsilon*, Rott. (greasy cutworm), *Euxoa messoria*, Harr. (dark-sided cutworm), *Feltia annexa*, Treit. (granulate cutworm), *Lycophotia margaritosa*, Haw. (variegated cutworm), *Porosagrotis orthogonia*, Morr. (pale western cutworm), and *Laphygma frugiperda*, S. & A. (fall armyworm), and has been reared from *Saturnia pavonia*, L., in Europe. Seamans' deductions regarding the greater effectiveness of the parasite in wet weather appear well grounded [*R.A.E.*, A, xi, 459].

The life of the immature larva is described [*R.A.E.*, A, xii, 51]; in the author's observations in Mississippi the females deposited larvae on the leaves and not mature eggs. In experiments it was found that 14 out of 16 infested caterpillars were killed, but none of the parasites matured, so that though the parasite may be of considerable importance, it would probably be overlooked in the field or even in insectary observations.

CHAMPLAIN (A. B.) & KIRK (H. B.). **Bait Pan Insects.**—*Ent. News*, xxxvii, no. 9, pp. 288-291. Philadelphia, Pa., November 1926.

Bait pans containing a watery solution of molasses and yeast hung in a peach orchard to control *Cydia molesta*, Busck (oriental peach moth) attracted many other insects. Notes on these are given.

LYLE (C.). **The Cotton Hopper (*Psallus seriatus* Reut.).**—*Qtrly. Bull. State Plant Bd. Mississippi*, vi, no. 2, pp. 1-4, 1 fig. A. & M. College, Miss., 1926.

The cotton hopper, *Psallus seriatus*, Reut., and the damage that it does to cotton are briefly described [*R.A.E.*, A, xii, 586; xiv, 629-632]. This Capsid was first found on cotton in Mississippi in 1925, but it did little damage in that year; in 1926 it occurred throughout the northern part of the State, where it caused considerable injury. In June and early July it was much more abundant on *Croton* and horse-mint [*Monarda*] than on cotton, but cotton was heavily infested during most of July; by 20th August the Capsids had almost entirely deserted the cotton, but were present in large numbers on *Croton*. Dusting with 10 lb. superfine sulphur to the acre, making two or more applications at intervals of four days, is recommended as a control measure; cotton treated in this way after considerable injury had already taken place was found, two weeks after the second application, to have 60 per cent. more squares and 33 per cent. more bolls to each stalk than cotton in adjacent plots that were not dusted. If the boll weevil [*Anthonomus grandis*, Boh.] is also causing serious damage, a dust of 2 parts superfine sulphur and 1 part calcium arsenate, 12 lb. to the acre, can be used to control both pests.

LYLE (C.). **The Tarnished Plant-bug on Cotton.**—*Qtrly. Bull. State Plant Bd. Mississippi*, vi, no. 2, pp. 7-10, 1 fig. A. & M. College, Miss., 1926.

During 1926, cotton in parts of Mississippi was attacked by *Lygus pratensis*, L. (tarnished plant bug), which caused an injury almost indistinguishable from that caused by *Psallus seriatus*, Reut. [see preceding paper]; it is probable that both Capsids transmit a virus that is the direct cause of the injury, more especially as *L. pratensis* causes injuries of a similar or related nature to many plants. In controlling this pest on cotton, good results were obtained by two or three applications of superfine sulphur at the rate of 10 lb. to the acre.

**Cicadas injure Cotton.**—*Qtrly. Bull. State Plant Bd. Mississippi*, vi, no. 2, p. 15. A. & M. College, Miss., 1926.

*Tibicen vitripennis*, Say, caused serious injury to cotton in June in a field in northern Mississippi; the females split the stalks and smaller branches during oviposition, destroying many of them. About 90 per cent. of the plants were injured, and one-quarter of the stand was destroyed.

HOLLOWAY (T. E.) & INGRAM (J. W.). U.S. Bur. Ent. **The Sugar Cane Mealybug in Georgia.**—*Planter & Sugar Manuf.*, lxxvii, no. 17, pp. 330-331. New Orleans, La., 23rd October 1926.

The sugar-cane mealybug, *Pseudococcus boninsis*, Kuw. (*calceolariae*, auct.), was first reported from Georgia in 1922. Barber, whose work on the subject is quoted [*R.A.E.*, A, xi, 268], found that the pest could be controlled in Louisiana by eliminating *Iridomyrmex humilis*, Mayr (Argentine ant), by which it is usually accompanied. The ants found in Georgia do not, however, belong to this species, but include *Camponotus abdominalis* var. *floridanus*, Buckley, *Dorymyrmex pyramicus*, Roger, *D. pyramicus* var. *niger*, Perg., and *Tetramorium guineense*, L. Experiments with ant poisons did not give satisfactory results, as the ants did not feed on them if they could obtain sufficient honey-dew from the mealybugs. The use of hot water before planting is discussed [*R.A.E.*, A, xii, 180]. For ordinary farm practice the recommendations are to plant only clean seed cane, and at some distance from infested fields; to cut cane well down to the surface of the ground; to destroy any scraps of cane left after grinding at the mills; and to avoid transporting the mealybug, by cleaning out wagons, etc., that have carried infested cane.

FROST (S. W.). **The Red-banded Leaf-roller.**—*Pennsylvania Agric. Expt. Sta.*, Bull. 197, 27 pp., 3 pls., 2 figs., 30 refs. State College, Pa., August 1925. [Recd. November 1926.]

During the last few years apples in Pennsylvania have largely depreciated in value owing to the scarring of the fruit by different leaf-rollers, of which *Eulia velutinana*, Wlk. (hitherto known only as a pest of certain flowers, small fruits, weeds and vegetable crops) caused the greatest amount of damage. It was found that the habits of this species differed widely from those of the common fruit-tree leaf-roller [*Tortrix argyrospila*, Wlk.], and that the remedies for the latter are

inapplicable, as hibernation does not take place in the egg stage. A complete list of food-plants is given; of these, apple seems to be the preferred one.

There are three generations a year; the first adults emerge from hibernation about the time that the buds are bursting and deposit from 40 to 125 eggs each in masses on the trunks and larger branches of apple. The first and second generation adults lay their eggs on the foliage of apple and other plants. The seasonal history, particularly as regards the larval and pupal periods of the first and second generations, differs considerably according to the season. The larvae of these generations feed mostly on the succulent foliage, rarely, even in the second generation, attacking the fruit, but those of the third generation feed chiefly on the fruit, making shallow scars on the sides of the apples, which, when made in early summer, appear at picking time as sunken russeted areas, or, when made in late summer or just before picking time, as fresh wounds. The damage continues until picking time, so that the larvae are often gathered with the fruit and continue feeding in the crates or other containers. The average length of the larval period of the third generation is 60 days; the activities of these larvae begin during the ripening of the fruit and may continue until late in November. They then pupate in crevices of the bark, or, more frequently, in curled, dried leaves, or under rubbish on the ground, and emerge as adults in the following spring. One Dipteron and 13 Hymenoptera (chiefly Ichneumonids) have been reared from pupae of *E. velutinana*; the most numerous of these parasites was *Glypta vulgaris*, Cress., but none of them occurred in sufficient numbers to give any degree of natural control.

Experiments in the control of *E. velutinana* are in progress. General recommendations are the use of lead arsenate at the time of the "pink spray" application, again at the end of June or early in July, and at the end of August or beginning of September, in order to poison the young larvae of the first, second and third generations respectively.

COMPÈRE (H.). **New Coccid-inhabiting Parasites (Encyrtidae, Hymenoptera) from Japan and California.**—*Univ. California Pubns. Ent.*, iv, no. 2, pp. 33-50, 9 figs. Berkeley, Cal., 1926.

The new species described are *Microterys clauseni*, reared from *Cero-plastes floridensis*, Comst., and *M. okitsuensis*, from *Coccus pseudo-magnoliarum*, Kuw. (citricola scale), both from Japan; and *M. yolandae*, from *Kermes cockerelli*, Ehrh., *M. physokermis*, from *Physokermes insignicola*, Craw, and *M. xanthopsis*, from *Lecanium corni*, Bch., and *L. persicae*, F., all from California. Keys are given to the females of the Japanese and Californian species of *Microterys*. The characters of the genus *Comperiella* are given, with a redescription of the species *C. unifasciata*, Ishii, and a key to the other species.

SMITH (H.S.) & COMPÈRE (H.). **The Establishment in California of *Coccophagus modestus*, Silv. (Aphelinidae, Hymenoptera) with Notes on its Life-history.**—*Univ. California Pubns. Ent.*, iv, no. 3, pp. 51-61, 2 figs. Berkeley, Cal., 1926.

An account is given of the successful establishment of *Coccophagus modestus*, Silv., introduced from South Africa into California, with notes on the life-history and a description of the stages and metamorphoses.

It is a primary parasite of *Saissetia oleae*, Bern. (black scale) and is considered to be one of the most effective enemies in South Africa. If more than one egg is deposited in a single host the larvae hatching out from them will fight until only one remains. Sometimes, when the parasite larva is developed within the host it receives an egg intended for a scale, in which case the resulting larva consumes the contents of the first inhabitant. Parthenogenesis occurs in *C. modestus*, the species being almost certainly thelytokous, as males are only occasionally found.

PICKETT (W. F.) & WILLIAMS (L. C.). **Spraying Fruit Plants.**—*Bienn. Rept. Kansas State Hortic. Soc., 1924-1925*, xxxviii, pp. 38-50, 3 figs. Topeka, Kans., 1926.

Notes are given on the more important insect pests and fungus diseases of fruits in Kansas, together with information on effective sprays and times of application.

HUNGERFORD (H. B.). **Dominance of Insect Life and its Relation to Horticulture.**—*Bienn. Rept. Kansas State Hortic. Soc., 1924-1925*, xxxviii, pp. 56-60. Topeka, Kans., 1926.

The reasons why insects have become pests are discussed, and *Gossyparia spuria*, Mod. (European elm scale), an insect new to Kansas, is given as an example of the danger of an introduced pest. The stages of this Coccid are described, and its bionomics and the method of control are given [*R.A.E.*, A, ix, 154 ; xii, 445]. Sprays of 40 per cent. nicotine sulphate, 1 : 800, applied in late June or July as the larvae are hatching, will reduce their numbers sufficiently to save the trees until the dormant spray can be applied. Additional factors in the spread of the pest are the transportation of the insect on nursery stock and wind carriage of infested leaves.

MARTIN, jr. (W. R.). **Codling Moth in the Arkansas Valley.**—*Bienn. Rept. Kansas State Hortic. Soc., 1924-1925*, xxxviii, pp. 51-56. Topeka, Kans., 1926.

The fluctuation in infestation of apples by the codling moth [*Cydia pomonella*, L.] in the valley of the Arkansas over a period of years during which consistent spraying had been carried out is discussed. In 1924 about 15-20 per cent. of the fruit contained larvae, and about 50-70 per cent. of the remainder were scarred by the larvae biting through the skin of the fruit before being killed by the spray. This proves that there are other factors as important as the proper timing of sprays, to which special attention had been paid. The quality of the spraying material was investigated, and tests made with the various lead arsenates on the market showed that there is an appreciable variation in their effectiveness. Experiments with casein and oil spreaders showed that oil spreaders were slightly more effective, but none gave sufficiently improved results to warrant its general use. Another factor is the abundance of the moth. In southern Kansas, owing to the dry climate and mild winters, mortality due to weather conditions is extremely low. Larvae that are carried into the packing sheds on the fruit pass the winter almost entirely protected from their natural enemies, and further complicate spraying operations, as the

moths emerge at a different time from those in the orchards. In southern Kansas during 1923 and 1924 natural enemies, of which the most important is the downy woodpecker, were not numerous enough to reduce the overwintering broods to any great extent. Counts taken to find how the set of the fruit on a tree affected control showed that although there are more larvae to an apple on trees with a light crop, fewer of these larvae ultimately survive because the spray material covers the fruit more thoroughly. The attack by codling moth is always more severe when the fruit has been previously damaged by such factors as hail or by *Tachypterellus* (*Anthonomus*) *quadrigibbus*, Say.

The following measures are recommended: the correct timing of sprays, the use of the best brand of lead arsenate obtainable, the screening of packing sheds to prevent the escape of emerging moths, the pruning of trees to allow a thorough application of spray, the removal of all loose bark to destroy overwintering larvae, the banding of each tree with burlap in the spring and the destruction (at intervals of about two weeks) of the larvae accumulating under the bands, and the removal of all fallen apples to prevent the larvae leaving the fruit and remaining in the orchard. It is also suggested that downy woodpeckers should be protected and attracted into the orchards by leaving a few bands of burlap full of codling moth larvae on the trees until midwinter. They may then be removed, and the birds will hunt for larvae in the other parts of the tree.

NEWCOMER (E. J.). U.S. Bur. Ent. **Laboratory Experiments with Arsenicals in the Control of the Codling Moth.**—*Jl. Agric. Res.*, xxxiii, no. 4, pp. 317–330, 23 refs. Washington, D.C., 15th August 1926. [Recd. December 1926.]

As the usual tests of control of the codling moth [*Cydia pomonella*, L.] in orchard-plots are subject to very variable conditions, the author has tried to obtain more accurate results in the laboratory by first spraying individual apples with standard strengths of lead arsenate, and then placing a given number of larvae on them and later recording the number of entrance-holes and of punctures made on the fruit. This method has been employed to show the relative value of various arsenicals, of various dilutions of arsenicals and of combination of arsenicals with other spray materials, the results being recorded in a series of tables. These tests only show the effect of such sprays when freshly applied, and leave many phases of codling-moth control untouched. The addition of a casein spreader containing about 20 per cent. of casein and 80 per cent. of hydrated lime materially improved the effect of any lead arsenate spray, and the smallest amount used ( $\frac{1}{8}$  lb. to 50 U.S. gals.) gave better results than any larger amount tried. An increase in the strength of the lead arsenate reduced the number of entrance holes of the larvae and generally increased the number of punctures, the total number of blemishes being very little reduced. A heavy application of lead arsenate gave somewhat better results than a light one. Although powdered lead arsenate was generally used in these tests, no appreciable difference was observed in the effect when equivalent amounts of paste were used. The addition of lime-sulphur to acid lead arsenate materially reduced its efficiency, but this reduction was overcome by the use of casein spreader with the combination spray. The lime in the spreader apparently

prevents or retards the usual reaction between lime-sulphur and acid lead arsenate. The addition of lubricating oil emulsion containing soap as an emulsifier generally gave poorer results than those obtained with lead arsenate alone, but when casein replaced soap as the emulsifier the control was somewhat better than with lead arsenate alone. Zinc arsenite was not so effective as lead arsenate. Paris green, with either lime or casein spreader, gave in 1923 slightly better results than lead arsenate, but in 1924 the control was poorer than with the latter. Four brands of powdered calcium arsenate were tried with poor results; a paste calcium arsenate gave results identical with those obtained from an equivalent amount of powdered lead arsenate.

BROOKS (F. E.). U.S. Bur. Ent. **Life History of the Hickory Spiral Borer, *Agrilus arcuatus*, Say.**—*Jl. Agric. Res.*, xxxiii, no. 4, pp. 331-338, 3 figs. Washington, D.C., 15th August 1926. [Recd. December 1926.]

There are several species of wood-boring beetles that, requiring dead or dying wood in which to develop, kill hickory and pecan branches and young trees in the eastern United States by girdling or otherwise severing the wood. One of these is the Buprestid, *Agrilus arcuatus*, Say, which reduces the crop of nuts by killing the medium-sized branches of bearing trees, though the chief loss is the damage done to young trees, especially in plantations near woods in which hickory grows. The eggs, of which females in captivity laid an average of 22 each, are deposited in summer, generally singly, on the smooth bark of the twigs, and hatch after about 26 days. The larva eats its way through the bottom of the egg, directly into the twig, where it makes elongate, threadlike burrows, next to the bark and through the wood. In late autumn, it begins a spiral burrow, which eventually severs the wood and kills the terminal above. This burrow may be completed in the autumn or in the following spring. After the coming of warm weather, the borer works downward, constructing a relatively wide burrow, and late in the season, turns abruptly and cuts a thin, symmetrical ring around the branch, afterwards boring spirally inward, encircling the stem again and finally reaching the heart. The terminal then breaks off very easily. After this the borer eats its way from the heart directly to the bark, above the outer tunnel of the spiral boring. It reaches the bark in spring, and after making a crooked burrow just beneath the bark, it forms a crescent-shaped pupal chamber. The pupae are present in May and June, the pupal stage lasting about 20 days. The adult beetle escapes by gnawing a hole through the bark.

The adults appear from May to July, according to the locality, the period of emergence lasting some 25 days. They feed on the leaves, making notches at the edges. The first eggs are laid from 10 days to 2 weeks after emergence. In captivity, oviposition continued during 51 days, the maximum egg production being from 12th July to 8th August. The females emerge a few days later than the males, and live about three weeks longer. Hymenopterous parasites include *Labena apicalis*, Cress., *Monogonogastra agrili*, Ashm., and *Zatropus* sp., near *Z. nigroaeneus*, Ashm.

In nurseries and plantations of small hickory and pecan trees, dusting or spraying with arsenicals might keep *A. arcuatus* in check. Young trees should be pruned of all infested branches and terminals as soon as

the leaves develop in the spring, and the prunings destroyed. Small, dead twigs that have been severed by the first-winter larvae should be clipped off a few inches below the dead part, in order to include the borer.

EVENDEN (J. C.). U.S. Bur. Ent. **The Pine Butterfly, *Neophasia menapia*, Felder.**—*Jl. Agric. Res.*, xxxiii, no. 4, pp. 339–344, 4 figs., 7 refs. Washington, D.C., 15th August 1926. [Recd. December 1926.]

*Neophasia menapia*, Feld. (pine butterfly), which is generally present in all the pine forests of the western United States and Canada, caused severe defoliation of thousands of acres of western yellow pine (*Pinus ponderosa*) in Idaho during 1922 and 1923 [*R.A.E.*, A, xiii, 82]. Other species of pine were attacked to a less extent in Idaho, and Douglas fir (*Pseudotsuga taxifolia*) has been recorded as a food-plant in British Columbia. The stages of the insect are described. There is only one generation a year in Idaho, but there is remarkable overlapping of the stages. The overwintering eggs hatch when new needles begin to appear on the pine, during early June. The young larvae feed in clusters on the needles and eat only the fleshy part, but after the first moult they consume the whole leaf. They are full-grown by the end of July, or about 50 days after hatching, and lower themselves by a silken thread to the ground, where they pupate. The adults emerge after 15 to 20 days. Eggs are normally deposited on the needles, at the top of mature trees, though on areas that have been severely defoliated the females seek suitable foliage on younger trees or migrate to other areas.

The outbreak of 1922–23 died down owing to natural enemies and by 1924 was completely ended. The most important was an Ichneumonid parasite, *Theronia fulvescens*, Cress., which oviposits on the caterpillars, the adults emerging from the host pupae in September. A predacious Pentatomid, *Podistus placidus*, Uhler, was also present in large numbers and may have been an important factor in control.

The exact percentage of loss due to *N. menapia* is difficult to determine; new needles were produced on many trees after two years' defoliation, but many of the over-mature, decadent trees were unable to recover and began to die in 1924–25. The effects of the outbreak will continue to show themselves for several years.

CARSNER (E.). **Susceptibility of the Bean to the Virus of Sugar-beet Curly-top.**—*Jl. Agric. Res.*, xxxiii, no. 4, pp. 345–348, 1 fig., 1 ref. Washington, D.C., 15th August 1926. [Recd. December 1926.]

While no previous study has apparently been made of a disease of the bean (*Phaseolus vulgaris*) caused by the virus of curly-top in sugar-beets, one variety of bean has once been recorded as non-susceptible to the disease. In 1924, however, a disastrous outbreak of disease in beans occurred in Idaho, which it was thought might be due to infestation of the beans by the leaf-hopper, *Eutettix tenella*, Baker, which transmits the virus of curly-top. Inoculation tests, made by caging virus-bearing leaf-hoppers with healthy bean plants of different varieties, showed that of seven varieties tested only one was fairly resistant to the disease. Later, when uninfected leaf-hoppers were fed

on the diseased beans and then transferred to healthy beets, these developed symptoms of curly-top. It is not known, however, whether the outbreak in the field was true curly-top disease or not. That the bean is not a favourite food of *E. tenella* is indicated by the fact that in the experiments all the leaf-hoppers died within 17 days after being caged on the beans. The author is therefore inclined to the opinion that it is only in seasons when the leaf-hopper is relatively very abundant that serious damage to the bean crop from curly-top is to be expected.

ROCKWOOD (L. P.). U.S. Bur. Ent. **Some Important Wheat Insects of the North Pacific Region.**—*Columbia Port Digest*, iv, no. 3, pp. 10–11, 25. Portland, Oregon, July 1926.

This is a brief account of the principal insect pests of wheat in the North-western United States, with notes on their biology and control. Restricted local grasshopper outbreaks sometimes occur in the humid western valleys, which are largely under cultivation or afforested, the species concerned being usually *Melanoplus femur-rubrum*, DeG. (red-legged grasshopper), which breeds in old clover fields and open pastures. Local outbreaks of *M. femur-rubrum*, *M. atlantis*, Riley (lesser migratory grasshopper) and sometimes *M. bivittatus*, Say (two-striped grasshopper) also occur in irrigated regions, where they breed in old lucerne fields and waste places. Grasshoppers are, however, seldom injurious in the extensive wheat areas where almost all the land is under cultivation, but *M. atlantis* and *Camnula pellucida*, Scudd. (clear-winged grasshopper) sometimes cause serious and extensive damage in the semi-arid districts where there are large areas unsuitable for cultivation in which they breed.

Cutworms occasionally cause considerable damage to wheat and other cereal crops; in the arid regions the species most often responsible is *Chorizagrotis agrestis*, Grote (western army cutworm), which has sometimes destroyed grain fields in April and early May, while in the humid regions *Sidemia devastatrix*, Brace, *Septis albina*, Grote, *Agrotis ypsilon*, Rott. (black cutworm) and *Neuria procincta*, Grote (olive-green cutworm) are sometimes injurious to grain crops. Wireworms [*R.A.E.*, A, xiii, 243] are the most important pests of wheat in the arid and semi-arid regions and also cause some damage in the humid western valleys.

Some loss to wheat both in the humid and semi-arid regions is caused by *Harmolita grandis*, Riley (wheat strawworm) [*R.A.E.*, A, viii, 76; xi, 458], but it can be controlled by crop rotation. The wheat-stem maggots, *Meromyza nigriventris*, Macq., and *M. americana*, Fitch (*flavipalpis*, Mall.) [*R.A.E.*, A, xiv, 472] also cause small losses to wheat in both regions and attack other grain crops and various grasses; they are potentially dangerous pests, but can be kept in check by the destruction in early September of self-sown wheat and second-growth wheat in areas cut for hay. *Mayetiola* (*Phytophaga*) *destructor*, Say (Hessian fly) occurs throughout the greater part of the humid region and causes some damage every year, especially where spring wheat is grown; extensive injury by this pest is prevented by the fact that winter wheat is planted late in this region, usually after the middle of October, after the disappearance of the flies, but fair numbers usually hibernate in self-sown wheat. Another wheat pest of potential importance in the humid region is *Sitodiplosis* (*Thecodiplosis*) *mosellana*,

Géhin (wheat midge), which, after being established for about 20 years in the Fraser River Valley, British Columbia, has recently spread into northern Washington and will probably continue to extend southwards; the larvae feed in the heads and cause the grains to shrivel.

ROCKWOOD (L. P.). U.S. Bur. Ent. **Alfalfa and Clover Insects in the North Pacific Region.**—*Columbia Port Digest*, iv, no. 4, pp. 8–9. Portland, Oregon, August 1926.

Red clover and lucerne are important crops in the North-western United States both as hay and forage crops and for seed production; red clover is grown principally in the humid western valleys, and lucerne in the irrigated and arid regions. Many insect pests attack both crops, and a few are confined to one or the other. Grasshoppers [see preceding paper] often cause considerable damage both to hay and to seeds, and outbreaks of cutworms occasionally occur, the most important species being *Lycophotia margaritosa*, Haw. (variegated cutworm), which caused serious damage in 1900 and 1914 and was locally injurious in 1925; another species is *Agrotis c-nigrum*, L. (spotted cutworm). *Phylometra* (*Autographa*) *californica*, Edw. (alfalfa looper) and *Colias* (*Eurymus*) *eurytheme*, Boisd. (alfalfa caterpillar) are sometimes injurious to lucerne in the arid regions.

The roots of clover and lucerne in the humid western valleys and some irrigated districts of the arid regions are damaged by *Sitona hispidula*, F. (clover root curculio) [*R.A.E.*, A, iii, 380], and in other irrigated districts *S. tibialis*, Hbst., is common. Clover and lucerne both in the humid and arid regions are also attacked by *Hypera punctata*, F. (clover leaf weevil), which, however, rarely causes much damage. The most serious pest of lucerne that threatens the Pacific region is *H. variabilis*, Hbst. (*Phytonomus posticus*, Gyll.), which has spread from Utah through southern Idaho to eastern Oregon; this weevil has been known to reduce the yield of hay by 50 per cent., and is also indirectly the cause of considerable loss through quarantine restrictions. Aphids often become abundant on clover and lucerne and may affect the yield of hay; the commonest in the Pacific region is *Illinoia pisi*, Kalt. (pea aphid), which is, however, much more injurious to annual leguminous crops. *Anuraphis bakeri*, Cowen (clover aphid) feeds mainly on the heads of clover and sometimes causes serious loss of seed. *Perrisia* (*Dasyneura*) *leguminicola*, Lint. (clover flower midge) [*R.A.E.*, A, iii, 266] is the most important pest affecting the production of clover seed, and occurs both in the humid western valleys and in parts of the irrigated region; it can be controlled by cutting the first crop of clover before the first generation larvae leave the heads. *Bruchophagus fumebris*, How. (clover seed Chalcid) attacks the seeds of clover and lucerne in all regions, but can be kept in check by clean cultivation. *Hylastes* (*Hylastinus*) *obscurus*, Marsh. (clover root borer) sometimes causes serious damage to clover by attacking the roots.

ROCKWOOD (L. P.). **The Clover Root Borer.**—*U.S. Dept. Agric.*, Dept. Bull. 1426, 48 pp., 15 figs., 50 refs. Washington, D.C., August 1926. [Recd. December 1926.]

*Hylastes* (*Hylastinus*) *obscurus*, Marsh. (clover root borer) is a serious pest of red clover wherever it is grown throughout the United States. Much of the information given on this Scolytid has previously

been noticed [*R.A.E.*, A, v, 326 ; xv, 45]. The total life-cycle requires a year or even longer, the stages considerably overlapping. The borers pass the winter in the roots, where they mature. The development of the borer and the damage caused by it are influenced by climate and soil, conditions of the plant, etc. The worst damage generally occurs in the second crop year ; sometimes serious injury occurs in the first crop year, and occasionally attacks may occur in the year of sowing. A few predacious enemies of the borer have been recorded, and in the present study the entomogenous fungus, *Beauveria globulifera*, was found to attack borers exposed above ground, and, less frequently, in their mines. Elaborate experiments with flight screens indicate that adults may fly as high as 50 ft. and possibly as far as 2 miles. The large numbers caught on small screens imply that enormous numbers of the adults fly simultaneously on favourable days, and therefore remedial measures by individual growers are of little benefit. A one-crop system of clover culture, with the general practice of early autumn ploughing in the clover fields, and, in cases of exceptionally severe infestation, summer ploughing and harrowing, should reduce the damage to negligible proportions in the first crop year.

CAFFREY (D. J.) & WORTHLEY (L. H.). **How to Fight the European Corn Borer this Fall.**—*U.S. Dept. Agric.*, Misc. Circ. 84, 4 pp., 1 fig., 1 ref. Washington, D.C., 1926.

The object of this circular is to assist the growers in harvesting the maize crop and the disposal of residues so that the European corn borer [*Pyrausta nubilalis*, Hb.] may be controlled in the Lake Erie region. There has been an alarming increase in infestation as compared with 1925, and the moth has now spread westward as far as eastern Indiana.

The parasites, *Pimpla* (*Exeristes*) *roborator*, F., *Microgaster tibialis*, Nees, *Microbracon* (*Habrobracon*) *brevicornis*, Wesm., *Eulimneria crassifemur*, Thom., and *Apanteles* sp., are being liberated in the infested areas of the region. By 1st July 1926, about 168,000 individuals had been liberated in Michigan, Ohio, Pennsylvania and western New York. At least one of these species has been reported as attacking the borer in New York and Ohio.

FLEMING (W. E.). U.S. Bur. Ent. **Water and Water Solutions of Organic Compounds as Dips for the Soil of Potted Plants infested with the Japanese Beetle.**—*Jl. Agric. Res.*, xxxiii, no. 9, pp. 821–828, 20 refs. Washington, D.C., 1st November 1926.

The fumigation used successfully against *Popillia japonica*, Newm., on large plants [*R.A.E.*, A, xiii, 339] cannot be used on smaller plants owing to mechanical difficulties. The experiments here described were undertaken to ascertain whether infestation in the soil of small potted plants could be destroyed by dipping them in water or in toxic solutions. The larvae resisted immersion in water for 15 days ; there is apparently no correlation between the mortality of the larvae and the amount of dissolved oxygen in the water.

The toxic solutions tried were o-cresol, phenol, benzyl chloride, carbon bisulphide, nitrobenzene, and sodium cyanide. Of these carbon bisulphide was the most effective in killing the larvae, the lethal dose varying in different experiments from 0.75 cc. to 1.375 cc. per litre ; 1.25 cc., however, proved fatal to salvia and nasturtium plants in 2-inch

pots. The results indicate that the effective action of any dipping solution is so dependent upon soil imbibition, soil adsorption, and soil absorption as to limit the application of even an effective insecticide to conditions where these factors are favourable.

HAENSELER (C. M.) & MARTIN (W. H.). **Arsenical Injury of the Peach.**—*Phytopathology*, xv, no. 6, pp. 321–331, 4 figs. Lancaster, Pa., June 1925.

The following is the authors' summary:—Injury to peach, caused by arsenical sprays, appears mainly as a leaf burning, which frequently results in premature defoliation, as necrotic areas at the older nodes of the new growth, or as cankers on the one-year old wood, which cause a splitting of the bark and gummosis. Atomic sulphur, flowers of sulphur and lime alone caused no injury. Powdered lead arsenate,  $1\frac{1}{2}$  lb. to 50 U.S. gals. water, when used alone or in combination with atomic sulphur, sulphur, or lime, caused severe injury. In mixtures containing sulphur, lime and lead arsenate, injury occurred only when the lime was appreciably reduced, or the lead arsenate increased over the amounts generally recommended. Self-boiled lime-sulphur, 8 lb. lime, 8 lb. sulphur to 50 U.S. gals. water, with  $1\frac{1}{2}$  lb. lead arsenate caused no injury, while dry-mix, 8 lb. sulphur, 4 lb. lime,  $\frac{1}{2}$  lb. calcium caseinate, 50 U.S. gals. water, with  $1\frac{1}{2}$  lb. lead arsenate, caused injury. In dry-mix, increasing the lead arsenate to  $2\frac{1}{2}$  lb. or reducing the lime to 2 lb. made the mixture more toxic. Weak trees were more subject to spray injury than vigorous ones. Sprays applied early in the season caused more injury than those applied later.

GINSBURG (J. M.). **The Effect of Moisture, Temperature, and Light on the Decomposition of Lead-arsenate in Sulfur-lime Dry Mix Spray.**—*Jl. Econ. Ent.*, xix, no. 6, pp. 841–853, 22 refs. Geneva, N.Y., December 1926.

The application of sulphur-lime dry-mix (4 lb. hydrated lime, 8 lb. sulphur and  $\frac{1}{2}$  lb. calcium caseinate to 50 U.S. gals. water) combined with 1 or  $1\frac{1}{2}$  lb. lead arsenate has caused considerable injury to foliage and fruit of apples and severe injury on wood of peach trees in New Jersey. It has been proved that the injury to peach may be directly attributed to the lead arsenate, and not to any of the other ingredients [see preceding paper]. Though previous investigations warrant the conclusion that the injury is directly due to the water-soluble arsenic present on the leaf surface, the process of decomposition producing it has not yet been explained. As the injury is more pronounced under conditions of prolonged humidity, high temperature and intense sunlight, investigations were undertaken in order to determine the effect of these factors on the decomposition of acid lead arsenate ( $\text{PbHAsO}_4$ ) mixed with lime, sulphur and calcium caseinate in the above proportions.

The following is taken from the author's summary and conclusions: Weighed quantities of the spray mixture were spread on large glass plates, exposed for 8 days to different atmospheric conditions and the water-soluble arsenic ( $\text{As}_2\text{O}_5$ ) determined. Two extremes in each of the three factors were adopted,  $80^\circ$  and  $110^\circ$  F., complete darkness and bright sunlight, and dry and moisture-saturated air. Both laboratory and field experiments were carried out. The results indicate that

neither sunlight, nor high humidity nor a temperature of 110° F., singly or combined, play any part in directly increasing the amount of water-soluble arsenic formed in the spray mixture. Large amounts of water-soluble arsenic are liberated when the spray mixture is exposed in thin layers to the atmosphere, owing to the formation of calcium carbonate, and still larger amounts are produced when hydrated lime is entirely replaced by calcium carbonate. In the presence of calcium carbonate, the sulphur evidently remains unchanged and no lead sulphide is formed. It is possible that high humidity, intense sunlight and high temperature may increase arsenical scorching on foliage indirectly by affecting the permeability and absorbing power of the plant tissue for water-soluble arsenic.

FROST (S. W.). **Apple Leaf-rollers of the Genera *Amorbia*, *Archips*, *Eulia*, *Pandemis* and *Peronea*.**—*Jl. Econ. Ent.*, xix, no. 6, pp. 813-819, 1 fig., 1 ref. Geneva, N.Y., December 1926.

A list is given of the leaf-rollers injurious to apple in North America and their alternative food-plants; they are *Tortrix* (*Archips*) *argyrospila*, Wlk., *T. (A.) franciscana*, Wlsm., *T. (A.) parallela*, Rob., *T. (A.) rosana*, L., *T. (A.) purpurana*, Clem., *T. (Pandemis) limitata*, Rob., *T. (P.) pyrusana*, Kearf., *Eulia velutinana*, Wlk., *E. quadrifasciana*, Fern., *E. mariana*, Fern., *Amorbia humerosana*, Clem., *Peronea logiana*, Schiff., *P. maculidorsana*, Clem., *P. maximana*, B. & B. (in Canada), *P. minuta*, Rob., and an undescribed species of this genus.

The author divides the above into groups according to their biological characters and briefly discusses the bionomics of the various genera and species, including also some that do not occur on apple. *Amorbia* hibernates in the pupal stage and has one generation a year; *Tortrix* (*Archips*) hibernates in the egg stage (as larvae in Canada) and has one or two generations a year; *Eulia* hibernates in the pupal stage and usually has three generations a year; *Peronea* hibernates as an adult and has three generations a year, while nothing is known about *Tortrix* (*Pandemis*). A chart is given summarising the life-history of typical leaf-rollers on apple.

LACROIX (D. S.). **The Life History and Control of the Cranberry Weevil, *Anthonomus musculus* Say (Coleoptera: Curculionidae).**—*Jl. Econ. Ent.*, xix, no. 6, pp. 819-829, 9 refs. Geneva, N.Y., December 1926.

*Anthonomus musculus*, Say (cranberry weevil) is a native of North America, occurring from Ontario and New England to the Rocky Mountains and south to Florida. It has been recorded on huckleberry (*Gaylussacia resinosa*), black chokeberry (*Pyrus melanocarpa*) and cultivated blueberry (*Vaccinium corymbosum*) and is now recorded from cranberry, apparently for the first time, though it is probable that most, if not all, the records of *A. suturalis*, Lec., on this crop, including certainly that of Franklin [*R.A.E.*, A, iii, 531], really refer to *A. musculus*. A short description of the different stages is given. This weevil occurs sporadically in cranberry bogs in Massachusetts, often causing considerable loss before its presence is suspected. The adults emerge from hibernation about the middle of May and are most active in the hot weather. Towards the end of May they feed on the old leaves and unopened terminal buds, also on any new growth that may have started.

The most serious damage is done by the feeding on the terminal growth ; in many cases the basal part of the new leader is attacked so that it dies back to the old wood. This injury looks like the effect of frost, for which it has sometimes been mistaken.

The eggs are laid in the blossom buds, usually at the base of the anthers, the process being described. The period of egg-laying may extend over 3-4 weeks, depending on the development of the buds and weather conditions. The larvae hatch in 3-9 days and at once begin to eat through the anthers, stamens and pistil, and finally eat away the interior of the immature ovary. The petals remain tightly closed together, become stiff and dry and form a protective cell for the larva and pupa. The larval stage lasts 10-14 days, and the pupal stage 5-7 days. The adults emerge about the end of June and beginning of July, and attack the immature fruit, new leaves and terminal buds. After the first week in August they begin searching for suitable hibernating quarters, and by September very few individuals can be found on the plants. After prolonged search in October some were found at the bottom of the bog under fallen leaves. It is possible that some migrate to the surrounding upland for hibernation, but this has not been proved. There is only one generation a year in Massachusetts. The only natural enemy found was a Chalcid, *Habrocytus* sp.

Of a number of insecticides tested a spray made as follows gave the best results : 4 lb. slaked lime is diluted in 25 U.S. gals. water, to which is added 3 lb. copper sulphate dissolved in 25 U.S. gals. water. About a gallon of this mixture is added to 3 lb. calcium arsenate powder, and when well mixed it is poured back into the spray tank. An extra U.S. quart or two of lime water should also be added. Immediately before application 2 lb. fish-oil soap dissolved in a little water should be well stirred into the spray. Provided that the soap is added last, and that there is an excess of lime, no injury to the foliage from soluble arsenic occurs. The mixture readily adheres to the plants and will withstand many rains without losing much toxicity. It should be applied at the rate of 300-350 U.S. gals. to the acre, before the buds show pink, so that the weevils are killed before they deposit their eggs. The pink or "pod" stage varies according to the time the winter floods are held on the bog, but is usually during the early part of June.

BALDUF (W. V.). *Telenomus cosmopeplae* Gahan, an Egg Parasite of *Cosmopepla bimaculata* Thomas.—*Jl. Econ. Ent.*, xix, no. 6, pp. 829-841, 3 refs. Geneva, N.Y., December 1926.

The Pentatomid, *Cosmopepla bimaculata*, Th., is a potential pest of snapdragon [*Antirrhinum*] in Illinois, but seems to be effectively controlled by the Scelionid, *Telenomus cosmopeplae*, Gah. The bug apparently passes the winter in the adult stage ; both nymphs and adults attack the snapdragon, feeding mostly around the buds and distal parts of the stem. There are probably 2-3 generations a year. The eggs are laid on various parts of the plants and are heavily parasitised by *T. cosmopeplae*. The act of oviposition and other habits of the parasite are described in detail. There are probably at least 2-3 generations a month during the most favourable period of the year, the life-cycle from egg to the emergence of the adult requiring 9-10 days. The development of the parasite continues for at least 3 months, from end of July to the end of October, hibernation presumably occurring in the adult stage.

INGRAM (J. W.). U.S. Bur. Ent. **Sodium Fluosilicate as a Control for Blister Beetles on Soybeans in Southwestern Louisiana.**—*Jl. Econ. Ent.*, xix, no. 6, pp. 853-858, 1 ref. Geneva, N.Y., December 1926.

Soy-beans [*Glycine hispida*] are being grown on a large scale in rotation with rice in south-western Louisiana, though some farmers have abandoned the practice owing to damage by *Epicauta lemniscata*, F. (striped blister beetle).

During 1923 and 1924, experiments were made with calcium arsenate and Paris green both with and without lime, as dusts and as sprays, but they only acted as repellents, the beetles refusing to eat the treated foliage. Various contact insecticides were tried without success, and the beetles are not attracted in any large numbers to lights. During 1925 sodium fluosilicate dust (analysed as sodium fluosilicate 97.9-98.1 per cent.) was tried and gave excellent results both experimentally and in practice. When the dust was combined with an equal part by volume of hydrated lime, the results were practically the same, except that the time between treatment and the death of the beetles was generally longer. There was no difference in the effect on the beetles whether the application was made in the morning with the dew on the plants or at any other time. The dust should be applied when the beetles first enter the field and are concentrated in a relatively small area. After treatment the beetles may hide in the soil or wander away (dead beetles in numbers have been found as far as 75 yards from the treated area), but they all die, presumably as a result of the poison entering the digestive tract.

Though the plants were dusted with the dew on them and in some cases rain followed dusting, no foliage injury occurred.

ABBOTT (W. S.). U.S. Bur. Ent. **Determining the Effectiveness of Dormant Treatments against the San José Scale.**—*Jl. Econ. Ent.*, xix, no. 6, pp. 858-860, 1 ref. Geneva, N.Y., December 1926.

Attention is called to the fact that a count of the numbers of the first generation of *Aspidiotus perniciosus*, Comst., settling on the new wood furnishes a reliable index of the effect of the dormant treatment and also a check on the accuracy of the count of dead and living scales made 30 days after the treatment. A very pronounced negative correlation is shown between the percentage of dead scales and the average number of young scales to the inch of new wood. This indicates that counts made 30 days after the application of the dormant spray give reliable results.

GABLE (C. H.). U.S. Bur. Ent. **Fighting Locusts with a Contact Insecticide.**—*Jl. Econ. Ent.*, xix, no. 6, pp. 861-863, 1 ref. Geneva, N.Y., December 1926.

During the latter part of June 1925 an outbreak of *Schistocerca obscura*, F., was reported from Texas. Though it occurs in various parts of the United States, this is apparently the first time that this locust has been recorded as causing serious injury to cultivated crops. The outbreak may have been due to the combination of an unusual abundance of the locusts and an extremely dry season, which stunted the growth of native

food-plants. The chief damage was done to cotton. As a rule the locusts congregate on the tops of trees and brush on the edge of the field and only enter the latter in numbers for feeding purposes. The immature forms did not attack the crops and are apparently restricted to the brush. As the outbreak did not come under the author's observation until all the locusts had become mature, there was no possibility of testing the standard bran mash against the immature stages. The adults were successfully destroyed on the trees by spraying with a standard cattle dip at the rate of 1 part to 80 of water. The dip used had the following analysis: total arsenic water-soluble as metallic 15.14 per cent., actual arsenious oxide ( $As_2O_3$ ) 20.02 per cent., water 44.40 per cent., equal parts of soft soap and sodium cresolate 20.44 per cent. The spray cannot be used on cultivated crops without causing serious injury. All the plants sprayed were severely scorched, but though they were well covered with the spray they produced no ill effect when given to cattle as food.

PETERSON (A.). U.S. Bur. Ent. **An Evaporation Cup useful for Chemotropic Studies of Insects in the Field.**—*Jl. Econ. Ent.*, xix, no. 6, pp. 863-866, 1 fig., 1 ref. Geneva, N.Y., December 1926.

The apparatus described consists of a small glass vial containing the aromatic chemical to be tested, inserted into a hole cut in the centre of a piece of cork. To prevent rain getting into the vial a covering is made of celluloid or thin stiff paper in the shape of an elongated diamond with the middle portion large enough to cover the open end of the vial. The pointed ends are pushed between the vial and the cork on opposite sides, forming an arch over the vial. The latter is floated on water in a container suspended from the branch of a fruit tree, when many of the insects attracted by the aromatic chemical fall into the water.

KÉLER (S.). **A Good Type of Cage for Rearing Parasites.**—*Jl. Econ. Ent.*, xix, no. 6, pp. 866-867, 1 pl. Geneva, N.Y., December 1926.

Three modifications of the same type of cage are described and illustrated. They were used for the rearing of *Pimpla nuceum*, Ratz., parasitic on *Anthonomus pomorum*, L. Two of them comprise a camera of glass or cork placed on the end of a glass slide and covered with a cover-glass. The third consists of an inverted tube fixed in a cork, but the use of this excludes the possibility of observations in transparent light.

COCKERELL (T. D. A.). **The European Rose-gall in Colorado.**—*Jl. Econ. Ent.*, xix, no. 6, p. 868. Geneva, N.Y., December 1926.

Though various species of *Rhodites* occur in Colorado, some sweet-briar roses (*Rosa rubiginosa*) that had been raised from seed were never attacked by any of them. In 1922, however, galls of *R. rosae*, L., a European species, were noticed on the plants. It was not attacked by the Chalcidoid parasites of the native species, but by European forms, namely, *Callimome bedeguaris*, L., and *Habrocytus bedeguaris*, Thomson.

HARTZELL (A.). **Oriental Peach Moth** (*Grapholitha molesta* Busck).—*Jl. Econ. Ent.*, xix, no. 6, p. 868. Geneva, N.Y., December 1926.

The finding of larvae in peach twigs in New York State has proved that the injury recorded during the past two seasons has been due to *Cydia* (*Grapholitha*) *molesta*, Busck (oriental peach moth).

HARTZELL (A.). *Aserica castanea* Arrow.—*Jl. Econ. Ent.*, xix, no. 6, p. 868. Geneva, N.Y., December 1926.

Adults of the Melolonthid, *Aserica castanea*, Arrow, have been captured on three occasions in New York State. One beetle was found at the roots of a seedling peach tree near a number of eggs, which it had apparently laid.

GOOD (H. G.). **Cotton Hopper Control**.—*Jl. Econ. Ent.*, xix, no. 6, pp. 869-870. Geneva, N.Y., December 1926.

*Psallus seriatus*, Reut. (cotton hopper) was noticed for the first time in Alabama in 1926. In many cases the bottom crop of cotton, which is the heaviest producer, was almost entirely destroyed, and the middle crop was also severely attacked. Sulphur has given good results in Texas and elsewhere, in view of which experiments were made with calcium cyanide S dust, composed of 50 per cent. sulphur and 50 per cent. calcium cyanide, with a cyanide content of between 17 and 25 per cent. The results were very satisfactory when the dust was applied once a week at the rate of 8-10 lb. an acre. No scorching of the foliage was noticed even when as much as 20 lb. an acre was used.

LIST (G. M.) & LANGFORD (G. S.). **Chrysanthemum Midge**, *Diarthronomyia hypogaea*, Löw.—*Jl. Econ. Ent.*, xix, no. 6, p. 871. Geneva, N.Y., December 1926.

*Diarthronomyia hypogaea*, Lw. (chrysanthemum midge) is recorded for the first time from Colorado, where a small infestation was found in a greenhouse.

JACOBSEN (W. C.). **Bureau of Plant Quarantine and Pest Control**.—*Mthly. Bull. Cal. Dept. Agric.*, xiv (1925), no. 7-12, pp. 146-172, 3 figs. Sacramento, Cal., 1926.

Owing to the greater volume of maritime shipping and the increase in vehicular traffic, there has been an appreciable increase in the plant quarantine inspection in California. The plant quarantine service is discussed by A. C. Fleury. Among the more important interceptions during the year were the larvae of the Mediterranean fruit-fly [*Ceratitis capitata*, Wied.] and melon fly [*Dacus cucurbitae*, Coq.] in fruits and vegetables from Hawaii; eggs of gipsy moth [*Porthetria dispar*, L.] on logs and plants from Japan; a Tortricid in chestnuts, and eggs of leopard moth [*Zeuzera pyrina*, L.] from Italy; the European earwig [*Forficula auricularia*, L.] in bulbs from Holland; cherry fruit-fly [*Rhagoletis*] in cherries from Oregon; and various important Coccids and other insects from different parts of the world, many of which are not yet established in California.

The text of the general order no. 147 of the U.S. Navy concerning the importation of fruits, vegetables and plants into the United States is given.

The alfalfa weevil, *Hypera variabilis*, Hbst. (*Phytonomus posticus*, Gyll.) has extended its range, necessitating alterations in the border quarantine stations. The infestation was undoubtedly due to natural flight of the weevil from the infested sections of Nevada. The importance of motor-cars in the spread of insects over long distances is pointed out; and an extensive list of insects intercepted on them is given. Some had been carried 100 miles or more; *H. variabilis* was particularly numerous, 3,246 individuals being taken from 529 cars, and as many as 349 being found in the camping equipment of one car. The recent interstate quarantine regulations are reviewed.

The work of the branch of vacuum fumigation is reported on by D. Mackie. Shipments to the extent of 20,000 citrus trees have been successfully fumigated with liquid hydrocyanic acid gas. This process may also be substituted for the usual practice of steaming railway wagons; it is safer and more convenient. Used at the rate of 1 oz. of liquid gas to 100 cu. ft. all boll weevils [*Anthonomus grandis*, Boh.] were killed. Successful experiments were also made with 2 oz. sodium cyanide solution to 100 cu. ft.

A brief account is given of the distribution and habits of various bulb pests in California; those recorded are *Merodon equestris*, F. (greater bulb fly), *Eumerus strigatus*, Fall. (lesser bulb fly), *Rhizoglyphus hyacinthi*, Banks (bulb-mite), *Anuraphis tulipae*, Boy. (tulip aphid), and *Liothrips vaneeckei*, Priesn. (lily thrips). The last two may be successfully treated with hydrocyanic acid gas at atmospheric pressure, but the use of this gas against the other pests has been discontinued. The bulb flies may be destroyed by vacuum fumigation for  $1\frac{3}{4}$  hours with 3 lb. carbon bisulphide to 100 cu. ft. in a 27 in. vacuum or by immersion in hot water at 110° F. for  $2\frac{1}{2}$ –3 hours, by which Nematodes [*Tylenchus dipsaci*, Kühn] are also killed. Hot water treatment should not be applied to iris bulbs.

URBAHNS (T. D.). **General Entomology.**—*Mthly. Bull. Cal. Dept. Agric.*, xiv (1925), no. 7–12, pp. 172–177. Sacramento, Cal., 1926.

Investigations to determine the cause of spray burn on peach trees treated with lime-sulphur and soda sulphur compounds show that the injury is due to faulty methods in timing and applying the sprays; where the trees were sprayed before the blossoms and leaf buds opened and at a time of day when the sprays would dry rapidly, there was little or no scorching.

*Tetranychus telarius*, L., though appearing late in 1925, caused considerable damage to various fruit-trees. Oil emulsions prepared with specially refined oils proved effective against all stages, including the eggs. Most of the prune trees sprayed with proprietary summer oils retained their foliage and continued to grow later than the infested unsprayed trees. French prunes from 13 orchards sprayed with summer spray oil had a sugar content of 44.99 per cent. as against 44.39 per cent. in unsprayed orchards, the water content being 22 per cent. in both cases. Summer oil emulsions are of great value in controlling *Pseudococcus gahani*, Green (citrophilus mealybug) on ornamental plants in nurseries. *P. maritimus*, Ehrh., attacks both grapes and pears, and is becoming increasingly injurious to the latter in certain districts.

Infestation on pear trees should be treated early, as the mealybugs enter the calyx end of the fruit. *Epitrimerus pyri*, Nal. (pear-leaf rust mite) may be controlled by thorough spraying with lime-sulphur in the cluster-bud stage. Other pests recorded are *Cydia* (*Carpocapsa*) *pomonella*, L. (codling moth), injuring plums, apples and walnuts; *Forficula auricularia*, L. (European earwig), damaging flowers; *Galerucella xanthomelaena*, Schr. (elm leaf beetle), which is spreading rapidly and causes considerable injury to shade trees; *Hypera variabilis*, Hbst. (*Phytonomus posticus*, Gyll.), a serious pest on lucerne; *Diabrotica soror*, Lec., unusually abundant in late June and July, attacking ripe apricots and early peaches; *Leptoglossus zonatus*, Dall. (western leaf-footed plant bug), causing damage to pomegranates and grapefruit [*Citrus decumana*]; and *Lepidosaphes ficus*, Sign. (fig scale), the further spread of which should be prevented if possible.

Grasshoppers were less injurious than in previous years, owing partly to the distribution of poison baits and partly to the abundance of native grasses.

MILBRATH (D. G.). **Plant Pathology.**—*Mthly. Bull. Cal. Dept. Agric.*, xiv (1925), no. 7-12, pp. 178-187, 4 figs. Sacramento, Cal., 1926.

Part of this report is devoted to the results of studies on the control of *Tylenchus dipsaci*, Kühn, in *Narcissus*, carried out by C. E. Scott [cf. *R.A.E.*, A, xiii, 52]. The hot water treatment is an efficient method of eradicating this Nematode, but should not be applied later than October. The bulbs dealt with in this way cannot, however, be depended upon to produce the normal number of flowers in the first season after treatment.

VAN DYKE (E. C.). [Notes on two Injurious Weevils.]—*Pan-Pacific Ent.*, iii, no. 2, p. 63, 3 refs. San Francisco, Cal., October 1926. [Recd. December 1926.]

The South American weevil, *Listroderes* (*Listronotus*) *obliquus*, F. (*nocius*, Lea) [*R.A.E.*, A, xi, 109, 505, etc.], has been recorded by T. D. Urbahns as damaging carrots in California, and has been found in several parts of the State. *Dyslobus granicollis*, Lec., has been reared by J. Wilcox from larvae damaging the roots of strawberry in Oregon; this weevil is fairly common in the North-western United States, but no species of the genus has previously been recorded as injurious in the larval stage to cultivated plants.

BORDEN (A. D.). **Some comparatively New Apple Insect Pests in California.**—*Pan-Pacific Ent.*, iii, no. 2, pp. 91-92. San Francisco, Cal., October 1926. [Recd. December 1926.]

Considerable injury to apples in central California has been caused by the tussock moth, *Hemerocampa vetusta*, Boisd., the hatching period of which extends from February to August in some localities, the leaf-rollers, *Tortrix* (*Archips*) *argyrospila*, Wlk., and *T. (Pandemis) pyrusana*, Kearf., the skinworm, *T. (Argyrotaenia) franciscana*, Wlsm. [*R.A.E.*, A, ix, 341], and the eye-spotted bud-moth, *Eucosma (Tmetocera) ocellana*, Schiff., which has apparently not been recorded previously in the State. In one district, in which from 30 to 60 per cent. of the

apples are damaged by insects, more than half the injury is caused by *T. argyrospila* and *T. pyrusana*, the latter, which has two broods a year, being much the more important. In another district *T. franciscana* is the most important pest.

FLANDERS (S. E.). **Variations in the Seasonal Development of the Walnut Codling Moth and its Host as influenced by Temperature.**—*Pan-Pacific Ent.*, iii, no. 2, pp. 93-94. San Francisco, Cal., October 1926. [Recd. December 1926.]

In 1925, after a cold winter, walnut trees came into leaf uniformly early in May, in Ventura County, Southern California, and the maximum pupation of hibernating larvae of the codling moth [*Cydia pomonella*, L.] took place on 17th May; there was a large crop of nuts, which developed early, and the codling moth was also abundant. In 1926, after a warm winter, the development of foliage on walnut trees was late and irregular, extending to July, but the emergence of *C. pomonella* was early, the maximum pupation of hibernating larvae taking place on 21st April; the spring and summer were, however, cool, and the walnut crop was small, and 20 per cent. of the larvae of *C. pomonella* leaving the nuts in the first week of July and 50 per cent. of those leaving in the last week of July spun over-wintering cocoons, so that the second brood would only be partial instead of complete as was suggested by the early spring emergence. It is thought that the minimum temperatures from December to April regulate the appearance of foliage on walnuts, while the total effective temperatures (assumed to be those above 50° F.) during the same period determine the appearance of the moths from the hibernating larvae.

ACKERMAN (A. J.) & ISELY (D.). **The Control of Unusually Severe Outbreaks of the Codling Moth.**—*Univ. Arkansas Coll. Agric., Extens. Circ.* 215, 4 pp., 1 ref. Little Rock, Ark., February 1926. [Recd. December 1926.]

The codling moth [*Cydia pomonella*, L.] was more destructive in 1925 in north-western Arkansas than in any previous season. The unusual severity of the outbreak was due to the warm nights and extended drought. Under such conditions additional sprays should be applied. In years when the larvae begin hatching early (2nd May in 1925) three instead of two cover sprays against the first brood are recommended [*R.A.E.*, A, xii, 181].

ISELY (D.). **Protecting Cotton from Injury by the Bollworm.**—*Univ. Arkansas Coll. Agric., Extens. Circ.* 218, 2 pp. Little Rock, Ark., March 1926. [Recd. December 1926.]

The cotton bollworm [*Heliothis obsoleta*, F.] is a serious pest of cotton in Arkansas, but seldom causes widespread injury in the same district in successive years. In midsummer the life-cycle occupies 35-40 days, and there are 3 or 4 generations a year. Many of the overwintering pupae in the ground may be destroyed by ploughing. The most effective means of protecting cotton is to use late maize that comes into silk about 2 weeks after the main crop of maize has hardened. If June maize is not planted, it is advisable to plant a trap-crop, 5-10 rows being sufficient to attract the moths from a field of cotton 300 ft. wide. The trap-crop should be planted on two dates so that it comes into silk

2 and 4 weeks after the main crop of maize hardens. Though it will not entirely protect the cotton, it will greatly reduce the damage. Maize should not be planted amongst cotton, as it serves as a source of infestation in the field.

Dusting with calcium arsenate at the rate of 5-7 lb. to the acre will kill newly hatched larvae, but can only be recommended as an emergency measure.

ISELY (D.). **Control of the Boll Weevil in Arkansas.**—*Univ. Arkansas Coll. Agric.*, Extens. Circ. 162 revd., 7 pp., 2 figs. Little Rock, Ark., April 1926. [Reed. December 1926.]

The information in this revised circular on the boll weevil [*Anthonomus grandis*, Boh.] is substantially the same as that in the previous one [*R.A.E.*, A, xii, 181].

ISELY (D.). **Early Summer Dispersion of the Boll Weevil with Special Reference to Dusting.**—*Arkansas Agric. Expt. Sta.*, Bull. 204, 17 pp., 4 figs., 6 refs. Fayetteville, Ark., February 1926. [Reed. December 1926.]

A briefer account of these observations on the boll weevil [*Anthonomus grandis*, Boh.] in Arkansas has already been noticed [*R.A.E.*, A, xiv, 266].

[**Insect Pests in Arkansas, 1924-25.**]—*Arkansas Agric. Expt. Sta.*, Bull. 203, pp. 32-40, 3 figs. Fayetteville, Ark., February 1926. [Reed. December 1926.]

The bagworm, *Thyridopteryx ephemeraeformis*, Haw., is one of the most destructive pests of shade trees in Arkansas, though its occurrence in great abundance is sporadic. The parasites, *Spilochalcis mariae*, Riley, and *Eupelmus amicus*, Gir., have been reared from cocoons collected in winter, while the Reduviid, *Arilus cristatus*, L., has been found feeding on the larvae in the bags.

*Hyphantria cunea*, Drury (fall webworm) attacks a number of fruit and shade trees and is an important pest of hickory and walnut. It is parasitised by *Apanteles hyphantriae*, Riley, and *Campoplex* (*Hyposoter*) *pilosulus*, Prov. The moths begin emerging about the middle of June, the eggs being laid from 20th June to about 7th July on the lower surface of the leaves. The larvae hatch in 10-11 days, and are full-grown in 3-4 weeks, giving rise to moths about 10th August. As young larvae have been found early in September, it is believed that there are two generations a year.

*Datana integerrima*, G. & R., is the most serious pest of walnuts in Arkansas, and in some years large numbers of trees may be entirely defoliated by it. The life-history is similar to that occurring in North Carolina on pecan [*R.A.E.*, A, xiii, 566]. The larvae are parasitised by *Heteropelma datanae*, Riley, and *Archytas* sp.

The information concerning the control of blister beetles has already been noticed [*R.A.E.*, A, xiv, 12].

There are two complete generations of the striped cucumber beetle [*Diabrotica vittata*, F.] in Arkansas during the year, and in 1925 individuals of a third and fourth generation were reared. Only the first two generations are of economic importance in the commercial melon-growing areas, though the others may injure the autumn crop. The

eggs are only laid in moist soil and will not hatch in dry soil. Calcium fluosilicate used in a compound containing 15 per cent. of the insecticide killed large numbers of the beetle. Sodium fluosilicate was also effective, but caused injury to plants when used alone. The addition of hydrated lime prevented the injury except when the material was applied after rains in July, when severe scorching occurred. A spray of 2 lb. lead arsenate to 50 U. S. gals. water or Bordeaux mixture proved effective as a repellent where the infestation was not severe.

A short account is given of the dispersion and seasonal habits of the boll weevil [*Anthonomus grandis*, Boh.] in cotton fields [*R.A.E.*, A, xiv, 266]. Dusting with finely powdered sulphur is effective against red spider [*Tetranychus telarius*, L.] on cotton provided that the temperature is above 75° F. A spray of 2 lb. potassium sulphide or 4 lb. soap to 50 U.S. gals. water is effective in gardens. Nicotine sulphate sprays and coarse sulphur dusts gave negative results.

PETTIT (R. H.). **Control of the Cherry Fruit-fly.**—*Michigan Agric. Expt. Sta.*, Circ. Bull. 86, 9 pp. East Lansing, Mich., March 1926. [Recd. December 1926.]

In cherry canning factories, many cherries are unusable in consequence of infestation by *Rhagoletis cingulata*, Lw. (white-banded cherry fruit-fly) and *R. fausta*, O.S. (dark cherry fruit-fly), the habits of which are briefly described, and also by plum curculio [*Conotrachelus nenuphar*, Hbst.]. The usual practice for separating infested from sound fruit has been to immerse all the cherries in water, when the infested ones generally float on the surface and can be skimmed off. The author has demonstrated, however, that the floating fruit must be immediately removed, or a proportion of it becomes water-logged and sinks with the sound fruit. Spray schedules for sour and sweet cherries are appended.

PETTIT (R. H.). **The Apple-maggot or Railroad Worm, *Rhagoletis pomonella*.**—*Michigan Agric. Expt. Sta.*, Circ. Bull. 87, 7 pp., 7 figs. East Lansing, Mich., March 1926. [Recd. December 1926.]

The bionomics of *Rhagoletis pomonella*, Walsh, and the means of differentiating it from *Cydia pomonella*, L., are briefly discussed. Fallen fruit should be destroyed immediately in order to kill the larvae before they enter the soil for pupation. After emergence the adult flies sip dew and scrape up particles from the fruit and leaves for several days before ovipositing, so that they may be killed during this period by spraying. Lead arsenate (2½ lb. powder to 100 U.S. gals. water) should be applied lightly during the first week in July, and the spray should be repeated once or twice at intervals of ten days or two weeks if the attack is serious. It is uncertain whether the efficacy of this spray is increased by the addition of 1 gal. cheap molasses.

GENTNER (L. G.). **Sting on Apples.**—*Michigan Agric. Expt. Sta.*, Circ. Bull. 93, 6 pp. East Lansing, Mich., April 1926. [Recd. December 1926.]

Large numbers of apples are found at picking time to be damaged by blemishes on the skin, which are either large depressions with a cork-like tissue covering them, or small holes surrounded by dark-coloured blotches. The blemish is first made by the larvae of codling

moth [*Cydia pomonella*, L.] of either the first or second generation, the earlier larvae producing the larger blemishes. The larvae causing them come chiefly from eggs laid on the fruit, and they die shortly afterwards without going deeply into the pulp. The blemishes appear to occur in proportion to the general infestation in an orchard. Few are found on apples in unsprayed orchards, though there may be many larvae within them. The proportion of blemished fruit is not appreciably reduced by arsenical sprays. Since the injury is chiefly due to larvae hatching from eggs laid on the fruit, it is suggested that a contact spray to kill the eggs, supplementary to the regular schedule, might do much to reduce the number of blemishes; otherwise the only hope lies in reducing the numbers of the moth in the orchard.

GENTNER (L. G.). **The Mint Flea-beetle.** --*Michigan Agric. Expt. Sta.*, Spec. Bull. 155, 13 pp., 4 figs., 2 refs. East Lansing, Mich., June 1926. [Recd. December 1926.]

An account is given of the life-history of the mint flea-beetle, *Longitarsus menthaphagus*, Gent. [*R.A.E.*, A, xiii, 237; xiv, 428] and of the damage that it causes to peppermint and spearmint, the cultivation of which is of great importance in Southern Michigan and Northern Indiana. Although only recently discovered, this Halticid is a serious pest of mint in Michigan, where it has probably been present for a number of years; in Indiana it has probably been established only for a few years, and has not so far done much damage, but appears to be spreading. The effect of a severe infestation is to cause a rapid fall in the annual production of the infested fields, so that in Michigan it is not now generally profitable to grow mint for more than three consecutive years in any one field, while in Indiana it has been possible to maintain fields in mint profitably for 10 or 20 years. The only food-plants of the larvae and adults appear to be species of mint [*Mentha*], and beetles caged on other plants found in the mint fields died without feeding; wild mint at a long distance from the nearest cultivated mint was found to be heavily infested, and it is probable that *L. menthaphagus* originally fed on native species.

There is only one generation a year. The adults appear in July and at first feed throughout the day, but later they feed only at night, remaining hidden during the day; they have not been observed to fly, but they migrate freely, although slowly, from field to field by jumping and crawling. Oviposition does not begin for three weeks or more after the beetles appear. The eggs are laid singly on the soil or between the soil particles and hatch in May; the larvae feed for about a month and then pupate in earthen cells usually in the top three inches of soil; the pupal stage lasts about three weeks. The only natural enemies observed were spiders and a predacious ground beetle, *Pterostichus* sp., attacking the adults.

Mint fields are usually planted before the eggs of *L. menthaphagus* have hatched, so that if the soil is shaken from the roots there should be little danger of introducing the pest into a newly planted field; for protecting newly planted fields from the migrating adults and for the destruction of the adults in the fields from which the crop has been harvested dusting is preferable to spraying. The best results were obtained with calcium arsenate, 10-20 lb. being used with 80-90 lb. talc or equal proportions of calcium fluosilicate compound and talc. These dusts

cost from 23 to 29 shillings for 100 lb., and should be applied at the rate of 40-50 lb. to the acre on uncut mint or 30-40 lb. on stubble; two or three applications may be necessary.

Paris green killed the beetles more quickly but was more expensive, rather heavy, and did not spread so well; lead arsenate was unsatisfactory, being repellent rather than toxic in action. Calcium fluosilicate compound (containing about 22 per cent. calcium fluosilicate) undiluted gave good control, although rather slow in action, and adhered well to the foliage. Of the materials used as carriers finely ground raw gypsum was rather heavy, lime had a repellent effect, and flour had a tendency to pack in the duster, but talc was satisfactory in all respects.

Cyanogas calcium cyanide B dust [*R.A.E.*, A, xiv, 74] killed the beetles but caused severe scorching of the leaves. Nicotine dusts containing even as much as 4 per cent. nicotine failed to kill the beetles.

PETTIT (R. H.). **Report of the Section of Entomology.** [Experiment Station.]—64th Ann. Rept. State Bd. Agric. Michigan 1924-25, reprint 9 pp., 12 figs., 1 ref. East Lansing, Mich., 1926.

During 1924 damage by *Cydia pomonella*, L. (codling moth) was not excessive. The cold backward summer delayed emergence (probably preventing it altogether in many cases), so that it was impossible to get the full benefit of the sprays even though they were applied at about the right time. The parasite *Ascogaster carpocapsae*, Vier., which was occasionally bred, may become a real factor in the control of the moth. *Galerucella luteola*, Müll., a pest new to Michigan, caused considerable damage to elms. It is hoped that a local increase of the apple-tree tent-caterpillar [*Malacosoma americana*, Harr.] will be checked by natural enemies. *Tortrix (Archips) fervidana*, Clemens (oak ugly-nest Tortricid) occurred in unusual numbers, while *Diapheromera [femorata]*, Say (common walking stick) defoliated several acres of oaks. *Leucothrips nigripennis*, Reut., which did considerable damage to ferns in green-houses, is believed to be new to America. *Stictocephala inermis*, F., occurred on apple; the scars, which were more in evidence than ever before, are caused by oviposition in the tissues of the twig in the autumn. *Lygus invitus*, Say (false tarnished plant bug) injured growing pears. Nicotine sulphate spray applied at the usual strength just after the fall of the petals is said to be efficacious against this pest. This spray may be combined with dilute lime-sulphur and lead arsenate, or a special spray of nicotine sulphate and soap may be used [*R.A.E.*, A, ii, 135]. A field which had been under maize for three years was badly attacked and the roots of the maize practically destroyed by *Diabrotica longicornis*, Say. Such attacks do not occur unless maize is cultivated for several years in succession. In the spring of 1925 there was a severe outbreak of both the ordinary and the climbing cutworms. Early in May *Agrotis (Noctua) fennica*, Tausch., was reported as attacking almost everything, including brush and undergrowth. In one district *Rhynchagrotis (Lampra) alternata*, Grote, severely injured the buds and new growth in apple orchards before banding could be accomplished, while in another there was a restricted attack by the common army worm [*Cirphis unipuncta*, Haw.]. Tests were made to determine the value of various sprays against the black cherry aphid [*Myzus cerasi*, F.] and various Aphids on apple. The sprays, which included derris, miscible oils and nicotine, used separately and in combination, were not entirely satisfactory against the former, but better results were obtained against the

latter. A severe attack of white grubs [*Lachnosterna*] occurred in one district, especially in market gardens. They also destroyed lucerne. *Oncideres cingulata*, Say (hickory girdler) was found. Other insects reared were: *Retinodiplosis resinicola*, O.S. (pitch midge) and *Petrova albicapitana*, Busck (western nodule-making moth), on Jack pine [*Pinus banksiana*]; *Coleophora laricella*, Hb. (larch case-bearer), on larch; *Paralechia pinifoliella*, Chamb. (pine needle miner), and a leaf-tyer, *Enarmonia (Épinotia) nanana*, Tr., on Norway spruce [*Picea excelsa*]; *Anystis agilis*, Banks, a mite predacious on the grape leaf-hopper [*Erythroneura comes*, Say]; and *Antispila isabella*, Clemens, on grape.

**The Cotton Worm in 1926.**—*Trop. Agriculture*, iii, no. 12, p. 246. Trinidad, December 1926.

The larvae of *Alabama argillacea*, Hb. (cotton worm) were unusually abundant in the West Indies in 1926. In St. Kitts and Montserrat cotton planted in March was attacked from April until the crop was ready for picking; in Antigua cotton planted in July was attacked in August; and in St. Vincent the attack on young cotton began towards the end of July. So far as is known this pest is not permanently established in the West Indies, and it is believed that its occurrence there is entirely due to the migration of adults from South America. Flights of these moths have not been observed in the West Indies, but northward migrations are known to occur in the United States [*R.A.E.*, A, xii, 421]. A close season is carefully observed in all the West Indian islands in which cotton is grown, and campaigns for the destruction of wild cotton have been carried on for several years, so that it is very unlikely that *A. argillacea*, which is not known to have any other food-plant than cotton, is able to breed in the islands except in the fields of cultivated cotton.

HANSFORD (C. G.) & MURRAY (P. W.). **The Mosaic Disease of Sugar Cane and its Control in Jamaica.**—*Dept. Agric. Jamaica, Microbiol. Circ.* 6, 1926, 39 pp., 34 refs. Kingston, 1926.

The history of mosaic disease of sugar-cane in Jamaica and elsewhere and the various investigations with regard to transmission and control are reviewed. *Aphis maidis*, Fitch, is the only insect proved to act as carrier of the disease in Jamaica; in the authors' experiments it would not apparently attack sugar-cane in the presence of other food-plants, but it is possible that it does so in nature [*cf. R.A.E.*, A, xi, 449]. A list of the plants recorded by various authors as attacked by sugar-cane mosaic is given, and the symptoms and appearance of the disease are described.

The available methods for the control of the disease are the cultivation of immune or tolerant varieties of sugar-cane, the selection of healthy tops for planting, and roguing. These methods are discussed in detail as applied to Jamaica. Uba cane is the only immune variety available there on a large scale. The advantages and disadvantages of this variety depend largely on local conditions, and a number of letters received from different planters on this subject are quoted. A note on the streak disease of Uba cane in Natal, which is transmitted by a Jassid, *Balclutha mbila*, Naude, is contributed by H. H. Storey [*R.A.E.*, A, xiii, 393].

KOPF (A.). **Situation entomologique et phytopathologique.**—*8<sup>me</sup> Rapp. Sta. agron. Guadeloupe, 1925-26*, pp. 32-38. Pointe-à-Pitre, 1926.

A doubt has arisen as to whether the moth-borer of sugar-cane in Guadeloupe, hitherto recorded as *Diatraea saccharalis*, is in reality that species. It is evidently well established in the Island, and remains at a fairly constant level in spite of varying climatic conditions; its presence encourages the growth of fungi, particularly *Colletotrichum fulcatum*, that attack the cane at the punctures made by it. While the chief methods of combating the borer are by cultural practices, such as choice of resistant varieties, hoeing, cutting down the canes to ground level after the harvest, etc., fungi can be very largely eliminated by immediately removing all debris of canes after the crop is cut. Immersion of the slips in water at 60° C. [140° F.] has given excellent results against the borer and appears also to stimulate germination. A fungus, probably a species of *Cordyceps*, that has been observed attacking the borer, is not apparently sufficiently widespread to be of much assistance in control.

Minor pests recorded are *Pseudococcus boninsis* (*calceolariae*) and *Diaprepes* on sugar-cane; *Leucoptera* (*Cemistoma*) *coffeella* on coffee; and *Plutella maculipennis* on vegetable crops. An unidentified Lepidopterous larva occurs on leaves of *Crotalaria striata* and sometimes on *C. juncea*; it also enters the pods of the former and eats the seeds. The larvae are often parasitised by a Tachinid of the genus *Zenillia*.

FULLAWAY (D. T.). **Termites, or White Ants, in Hawaii.**—*Hawaiian Forester & Agric.*, xxiii, no. 3, pp. 68-88, 15 figs., 1 ref. Honolulu, 1926.

In Hawaii the most destructive termites are *Coptotermes intrudens*, Osh., and *Cryptotermes piceatus*, Snyder. *C. intrudens* [R.A.E., A, viii, 435], is considered by Light to be a synonym of *C. formosanus*, Shir. [R.A.E., A, viii, 301]. This termite nests in the soil, on which it depends for a suitable amount of moisture. Communities found outside Honolulu were probably established by winged termites transported by trains, boats, cars, etc., so that there is a danger of the rapid spread of this species as means of transportation improve. The aerial portions of a community may be found in large beams in buildings where a moist condition is more or less constant. It is said that the cephalic secretion of the soldier of this species acts as a solvent of lime, enabling it to penetrate brick, stone and tile walls joined with lime mortar.

*Cryptotermes piceatus* is principally a house-infesting species and is found in the framework, and to some extent the supports, in floors, ceilings, furniture and wood products generally. It also attacks paper and cloth, and even living plants.

Details are given of the use of concrete and termite guards in the construction of termite proof buildings; the use of termite repellents and soil fumigants; the treatment of wood; and employment of resistant timbers [R.A.E., A, viii, 301; x, 192; xii, 441; xiii, 277, 287]. Natural enemies are briefly discussed.

**Report of the Board [of Commissioners of Agriculture and Forestry], 1925-26.**—*Hawaiian Forester & Agric.*, xxiii, no. 3, pp. 88-92. Honolulu, 1926.

In a short section on entomology, a brief account is given of the introduction of parasites and predators of insect pests in Hawaii [R.A.E.,

A, xiv, 500]. A Tachinid, *Ochromeigenia ormioides*, Towns., and a Scoliid, *Tiphia* sp., attacking the adults and larvae respectively of *Adoretus sinicus*, Burm., have been introduced from Formosa, and several hundreds have been released.

EHRRHORN (E. M.) & WHITNEY (L. A.). [Report of the] Division of Plant Inspection, May-August 1926.—*Hawaiian Forester & Agric.*, xxiii, no. 3, pp. 106–109. Honolulu, 1926.

The pests intercepted include: From California, *Phenacoccus* sp. on rose plants, Aphids on gladiolus bulbs and chrysanthemum, *Pseudococcus* sp. on fuchsia, *P. maritimus*, Ehrh., on dahlia bulbs, pears, peaches and fresh apples, *P. citri*, Risso, on ornamental plants, *Aspidiotus perniciosus*, Comst., on apples, *Heliothis (Chloridea) obsoleta*, F., on maize, *Eriosoma lanigerum*, Hausm., on apples, and *Orthezia insignis*, Dougl., on *Coleus* and *Primula*; from Missouri, Lepidopterous larvae on dwarf fruiting orange tree; from New Jersey, Aphids on chrysanthemum, *Chrysomphalus aonidum*, L., on *Dracaena indivisa*, and *Pseudococcus adonidum*, L. (*longispinus*, Targ.) on *D. sanderiana*; from Texas, Bruchids and Lepidopterous larvae in seed pods of mesquite [*Prosopis*]; from Pennsylvania, an Aphid on gladiolus bulbs; from Tahiti, Scarabaeid larvae in cuttings of breadfruit [*Artocarpus incisa*]; from Fiji, *Chrysomphalus* sp. on lemons; from the Philippines, a Bostrychid beetle in bamboo, Dermestid larvae in dried fish, and *Pseudococcus* on orchid and on ginger roots; from Japan, *P. comstocki*, Kuw., on sandpears [*Pyrus sinensis*] and *Euonymus*, *Lepidosaphes ficus*, Sign., on sandpears, *Dermestes* sp. and earwigs in dried fish, and *Calandra (Sitophilus) oryzae*, L., on rice candy; from China, *Cylas formicarius*, F., and a mealybug on sweet potatoes; and from New Zealand, *Pheidole* sp. in packing material, *Hemichionaspis* sp. and *Lecanium* sp. on *Phoenix roebeleni*, and *Trionymus* sp. on flax.

TILLYARD (R. J.). **The Insects of Australia and New Zealand.**—Svo, xv+560 pp., 44 pls., numerous figs., refs. Sydney, Angus & Robertson, Ltd., 1926. Price 42s.

This work is intended primarily as a text-book for students of entomology in Australia and New Zealand and is mainly concerned with morphology and classification. The first four chapters deal with the class Insecta as a whole and are followed by chapters on each of the 24 orders accepted by the author.

The arrangement adopted in dealing with the orders is uniform throughout. First there is a section on the morphological characters of the order, followed by paragraphs on life-history, distribution, fossil history and economic importance; then there is a scheme of classification into superfamilies and families, the number of species of each known to occur in Australia and in New Zealand being indicated; finally, there are keys to the superfamilies (the names of some of which are used for the first time in this work) and families, discussions of each family, in which notes on species of economic importance, both native and introduced, are included, and a list of selected references.

The last two chapters contain an account of the fossil insects of Australia and New Zealand, and instructions for the collection, preservation

and study of insects. The work concludes with a glossary of biological and entomological terms, a list of abbreviations of authors' names, and a comprehensive index.

TONKIN (L. C.). **Codlin Moth Control.**—*Fruit World of Australasia*, xxvii, no. 11, p. 512. Melbourne, 1st November 1926.

The chief factor in controlling the codling moth [*Cydia pomonella*, L.] in Australia and New Zealand is the correct timing of sprays. In the United States, where the moths emerge sooner after the flowering of apples than in New Zealand, the calyx spray is of great importance, but it appears that the later sprays are more important in New Zealand. In the United States it is advised that the first cover spray, following the calyx spray, should be applied when the temperature reaches 60° F. at 8 p.m. on three successive evenings; in 1925 the author found that this occurred on 20th December in Otago, New Zealand, and that that date coincided with the first capture of codling moths in traps, indicating that it was not necessary to apply a calyx spray.

WARD (J. M.). **Combined Oil-Bordeaux Spray.**—*Fruit World of Australasia*, xxvii, no. 11, pp. 532-533. Melbourne, 1st November 1926.

Experiments with oil combined with Bordeaux mixture for spraying fruit trees have been carried on for several years in Victoria with promising results. Directions are given for making a cold oil emulsion, the formula being 4 gals. lubricating oil (or 5 gals. crude residual oil or kerosene), 1 lb. copper sulphate dissolved in 3 gals. water, 1 lb. fresh lime in 1 gal. water, and water or Bordeaux mixture to make 80 gals. The crude oil emulsion is effective against the woolly aphis [*Eriosoma lanigerum*, Hausm.], but kerosene or lubricating oil should be used against scale-insects or Aphid eggs.

HARUKAWA (C.). **Submergence as a Control Measure for the Rice-borer, *Chilo simplex*, Butler.**—*Ber. Ohara Inst. landw. Forschungen*, iii, no. 2, pp. 177-184. Kuraschiki, 1926.

These experiments were undertaken to determine the effect of submergence on the rice-borer *Chilo simplex*, Butler [R.A.E., A, ix, 6]. From the results of previous work in 1917-19 and from the present experiments in 1923-25 the following conclusions are drawn: Submergence for 24 hours kills 30-40 per cent. of the rice-borers when the maximum temperature of the water in the rice-field is about 35° C. [95° F.]. If the duration of submergence is increased to 30-32 hours, over 40 per cent. can be killed, or 20 per cent. if the maximum water temperature is 32° or 33° C. [89.6° or 91.4° F.]. When the maximum temperature of the water reaches 41° C. [105.8° F.] or over, about 70 per cent. can be killed by submergence for 32 hours. These figures apply if the rice-field is simply flooded for a certain time. If the field is flooded and at the same time the rice-plants are bent down at their bases to the bottom of the water so that the plants are completely covered, over 80 per cent. can be killed in 24 hours. The first method, applied for 24-30 hours, hardly affects the yield of rice; the second method, applied for 24 hours, decreased the yield about 6 per cent. As regards the increase of yield obtained by checking *C. simplex*, it is

difficult to determine the true benefit of submergence. It is obvious that the first method is advisable when the borer is fairly abundant, while the second method may be employed in a serious outbreak when more than 50 or 60 per cent. of the plants would be killed if no measures were taken. Even so, it is doubtful if this would be more profitable, in view of labour costs, than cutting off the injured stalks.

VAN DER GOOT (P.). **Bestrijding van de aardappelknolrups in goedangs.** [Combating the Potato-tuber Moth in Storage.]—*Korte Meded. Inst. Plantenziekten*, no. 1, 17 pp. Buitenzorg, 1926. (With a Summary in English.)

The occurrence of *Phthorimaea operculella*, in stored potatoes in Java, is nearly always due to the storing of slightly infested tubers in the dry season, freshly harvested ones being uninfested in the rainy season. The only thoroughly satisfactory method of control is fumigation with carbon bisulphide. In the lowlands, at temperatures of 74 to 83° F., all stages are killed by using 25 cc. per cu. metre for 24 hours; in the highlands, where the potatoes are grown, the freshly laid eggs require more than double this quantity at temperatures of 52 to 75° F. In the store the eggs are laid on the tubers and on rough surfaces such as wood, etc. In the lowlands a generation develops in 25 days, but in the potato-growing regions as much as 46 days may be required. A female lays 85–100 eggs on an average, and lives for about 19 days in the lowlands and 23 days in the highlands. Where fumigation is difficult the removal of all potatoes, cleaning of the room and letting it remain empty for 45–60 days has proved effective in getting rid of serious infestations. The best and simplest way to prevent further infestation is covering the potato heaps with a 4-inch layer of earth, which prevents the larvae hatching from eggs deposited on the earth from reaching the tubers. Infested potatoes may also be covered up, as though the moths can make their way out, they do not breed under such conditions.

HUTSON (J. C.). **Prickly-pear and Cochineal Insects.**—*Trop. Agriculturist*, lxvii, no. 5, pp. 290–292, 2 pls. Peradeniya, November 1926.

The wild cochineal insect, *Dactylopius indicus*, has maintained control of the prickly-pear, *Opuntia monacantha*, in Ceylon, where it was introduced for the purpose many years ago, but unfortunately it is unable to feed and reproduce on the other Ceylon species, *O. dillenii*, which has become a pest in the northern parts of the Island. In 1923, the Commonwealth Prickly Pear Board reported that an American cochineal insect, *D. tomentosus*, was found capable of living on *O. dillenii* in Australia. As tests demonstrated that there was very little danger of this insect attacking any other plant than Cactaceae and it was being liberated in Australia, a consignment was sent from Australia and cultures were made at Peradeniya. The insects were then distributed in northern Ceylon, and although their increase was at first very slow, within 14 months the earlier-infested areas had been cleared of prickly-pear and there was no sign of fresh plants appearing, and after 18 months there was no part of the formerly infested area of 30 acres where the pear remained unaffected. As the insect is unable to spread where there are gaps between clumps of pear, it was found necessary to distribute it artificially. The distinguishing characters of the two species of prickly-pear, *O. monacantha* and *O. dillenii*, are given.

KARNY (H. H.). **Studies on Indian Thysanoptera.**—*Mem. Dept. Agric. India*, Ent. Ser., ix, no. 6, pp. 187–239, 8 pls., 28 figs. Calcutta, September 1926. [Recd. December 1926.]

This is a complete list of the known Thysanoptera of South India. The new species include: From Coimbatore, *Hydatothrips ramaswamiahi*, on indigo; *Anaphothrips oligochaetus*, in flowers and shoots of cotton, and in flowers of *Caesalpinia pulcherrima* and pomegranate; *A. ramakrishnai*, in ears of *Pennisetum typhoideum*; *Stylothrips* (gen. n.) *brevipalpis*, and *Haplothrips ramakrishnai*, in *Chrysanthemum* flowers; *Ramaswamiahiella* (gen. n.) *subnudula*, in flowers of *Calotropis*, *Hibiscus rosa-sinensis* and other plants; *Dolichothrips ochripes*, in shoots of *Cassia tora*; and *Mesothrips apatelus*, badly damaging leaves of *Ficus retusa*. From Malabar, *Ayyaria* (gen. n.) *chaetophora*, in flowers of cowpea (*Vigna catjang*).

MEYRICK (E.). **Description of *Laspeyresia stirpicola*, n. sp. (Lepidoptera).**

MISRA (C. S.). **A Short Note on the Life-history and Status.**—*Mem. Dept. Agric. India*, Ent. Ser., ix, no. 9, pp. 259–260, 1 pl. Calcutta, September 1926.

The Tortricid, *Laspeyresia stirpicola*, sp. n., is described from Bihar. It is a serious pest of *Butea frondosa*, which is used extensively for lac cultivation. Eggs are laid in the axils of the leaf-buds, and the larvae tunnel into the stem until they reach the pith, on which they feed. When full-fed, the larva makes a silken gallery, in which it pupates. Practically every tree of *B. frondosa* in the locality was found to be infested, as many as seven borers being found in one tree, with the result that growth is stunted, galls are produced, the bark becomes rough and hard and there is considerable outflow of resinous matter, so that the tree becomes unfit for the propagation of lac. In one caterpillar, three Strepsipterous larvae were discovered.

SAWER (E. R.). **Entomological Service.**—*Dept. Agric., Forests & Fish., Palestine Ann. Rept. 1925*, p. 15. [Jerusalem, 1926.]

Fumigation against black scale [*Chrysomphalus aonidum*, L.] in citrus orchards has been continued with success [*R.A.E.*, A, xiii, 606]. Experiments with various insecticides, such as kerosene, resin and lime-sulphur sprays, for the control of the fig scale [*Ceroplastes rusci*, L.] have not been successful.

Demonstrations for the control of the olive fruit-fly [*Dacus oleae*, Gmel.] by spraying with standard poisoned sugar compound have been made near Jerusalem. The plant inspection service maintained at the ports of entry examined 4,123 consignments, resulting in the interception of 65 dangerous pests.

ROUBAUD (E.). **Sur un champignon entomophyte parasite des fourmis en Afrique équatoriale.**—*Bull. Soc. Path. exot.*, xix, no. 9, pp. 815–819, 1 fig., 2 refs. Paris, 1926.

The parasitism of the ant, *Paltothyreus tarsatus*, F., by a fungus of the genus *Cordyceps* in the Belgian Congo is described. A feature of this parasite is the appearance of what is apparently an alternative generation; this is an Isarian form, which is more or less saprophytic, and

occurs as a giant tendril-like stroma on neighbouring vegetation. It is hoped that further investigation may determine the true biological significance and the pathogenicity with regard to insects of this form.

VAYSSIÈRE (P.). **Contribution à l'étude biologique et systématique des Coccidae.**—*Ann. Epiphyties*, xii, no. 4-5, pp. 197-382, 6 pls., 95 figs., 137 refs. Paris, 1926.

The author discusses the systematic position of Coccids, with special reference to the subfamily MONOPHLEBINAE. The general characters of this subfamily are described, and the author takes a typical species (*Guerinia serratulae*, F.) and explains its development, biology and the parasites associated with it. A key is given to the genera, and a number of new species are described from the Belgian Congo, viz., *Aspidoproctus congolensis*, on copal; *A. ghesquierei*, on *Sophora vicifolia*; *Icerya corticalis*, on the bark of an unidentified tree; *I. maynei*, and *I. schoutedeni*, on *Acalypha*; and *I. tremae*, on coffee, the native *Trema guineensis*, and several cultivated imported plants. *Aspidoproctus ellenbergeri*, sp. n., is described without particulars as to food-plant or locality, and for a number of other species redescrptions or supplementary descriptions are given.

In Part II, the factors influencing the distribution of Coccids are reviewed, under the headings of geographical conditions and of food-plants, some Coccids being confined to a single species and some to certain genera, while others are apparently polyphagous. They are also classified according to the part of the plant they attack, and the methods of dissemination are discussed.

DIEUZEIDE (R.). **Le *Beauveria effusa* (Beauverie) Vuillemin, parasite du Doryphore de la pomme de terre.**—*Rev. Zool. agric. & appl.*, xxv, nos. 9 & 10, pp. 129-134 & 145-154, 6 figs., 7 refs. Bordeaux, September & October 1926.

As it has been suggested that fungi of the genus *Beauveria* might be used with success against insect pests, the author undertook experiments with *B. bassiana*, *B. globulifera* and *B. densa*, against the Colorado potato beetle [*Leptinotarsa decemlineata*, Say] in the Gironde district. Infection of different stages of the insect was attempted in the laboratory by various methods, these experiments being described in detail. Preliminary experiments indicated that the expense of carrying out tests on a larger scale would be prohibitive.

A number of the beetles removed from hibernation in the soil for experimental purposes and kept in a very damp condition were found to be heavily infected with a fungus that was identified as *B. effusa*; the conditions were, however, unusual, and it is very unlikely that such a degree of infection would ever occur in nature. Beauverie's description of the four species of *Beauveria* is quoted. The author subsequently turned his attention to experiments with *B. effusa*, with particular reference to its effect on hibernating adults of *L. decemlineata*. By thoroughly mixing cultures of this fungus in soil kept damp, 100 per cent. of the beetles present were killed in some of the tests, but in dry soil no result was obtained. A number of Lepidoptera were all experimentally infected with *B. effusa*, as well as with other species of this genus. It is hoped, when the biology of these fungi is better understood, that their use on a large scale for the control of insect pests may prove of value.

TEMPÈRE (G.). **Un Coléoptère Nitidulide, parasite du Muflier des jardins.**—*Rev. Zool. agric. & appl.*, xxv, no. 10, pp. 155–158, 1 fig., 3 refs. Bordeaux, October 1926.

The pests of *Antirrhinum* commonly recorded are such general pests as *Heliothis obsoleta*, F., *Argyroploce* (*Olethreutes*) *hebesana*, Wlk., *Phlyctaenia* (*Pionea*) *rubigalis*, Guen., the mite, *Tarsonemus pallidus*, Banks, and the Nematode, *Heterodera radiculicola*, Greef, while the Tineid, *Stigmatophora serratella*, Tr., and the Curculionid, *Mecinus sicardi*, Hust., have been observed on the roots. The author has recently added to this list the Nitidulid, *Heterostomus vestitus*, Kiesw., two or three of these larvae being frequently found in one flower, devouring the internal parts and particularly the anthers, and sometimes perforating the corolla. This pest seems to have been widely distributed in 1926 and is active throughout the greater part of the growing period of the plant. If a serious outbreak should occur, it is suggested that the insects should be collected as soon as they begin to appear, that is, from the end of April, by shaking the stems over a receptacle. This should be done in the early morning or in cloudy weather, and should be repeated several times. Insecticides are practically useless, but repellents such as nicotine might prove effective.

VERGUIN (J.). **La question de la mouche des cerises.**—*C.R. Acad. Agric. France*, xii, no. 36, pp. 998–1003, 1 ref. Paris, 1926.

The cherry fruit-fly, *Rhagoletis cerasi*, L., which was formerly considered to be a comparatively insignificant pest in France, has assumed great importance on account of the order prohibiting the importation of cherries into Great Britain from districts in France in which it occurs [*R.A.E.*, A, xiv, 510]. This order caused heavy losses to cherry growers in France in 1926, as large quantities of cherries are normally exported to England every year. The varieties of cherries are not equally subject to attack, those most frequently damaged being the ones with firm and sweet flesh; if varieties can be found that are immune from the fruit-fly, it is possible that they may be excepted from the general prohibition, and the subject merits investigation. The only complete solution of the problem, however, lies in the extermination of the pest, and for this satisfactory measures remain to be discovered. The author considers that the cultivation of lower-growing trees, such as has been adopted in some districts, would be advantageous, as it would facilitate picking the entire crop and the application of insecticides. The cultivation of the top soil in orchards in winter cannot be recommended, as Caesar and Ross found that this process actually assisted the emergence of the adults of the apple maggot, *R. pomonella*, Walsh, from their puparia, and that they were able to penetrate through 18 inches of soil.

DELPONT (M.). **Essais de lutte contre les ennemis des plantes sarclées.**—*Vie agric. & rurale*, xxix, no. 52, pp. 405–406. Paris, 25th December 1926.

In France *Euxoa* (*Agrotis*) *segetum*, Schiff., hibernates as a full-grown larva, and the adults emerge in May and lay eggs that hatch in June; the larvae damage vegetable crops from the middle of June to the middle or end of July, and pupate after a resting period of 3 or 4

days, producing adults about the end of August. These adults give rise to a second generation of larvae that feed from the end of September to October and enter the ground for hibernation. Measures against *E. segetum* in weeded crops fall into three categories, cultural operations, destruction of the adults, and the use of insecticides or repellents against the larvae. The object in winter cultivation should be to bring to the surface the larvae that are hibernating at a depth of 6–8 inches so as to expose them to frost, but in the spring the soil should be firm, as loose soil is favourable to the larvae; planting out should be done as early as possible in order that the growth of the plants may be well advanced before they are attacked. The destruction of the adults is not usually practicable, as light traps, unless used simultaneously throughout an area, merely tend to cause them to concentrate; poison baits are dangerous where there are animals. In the author's experiments arsenical sprays were unsuccessful in controlling *E. segetum*, but good results were secured by the application of crude ammonia [*R.A.E.*, A, ii, 349] to the soil, 3–4 months before planting out, at the rate of 14 cwt. to the acre; this substance controlled *E. segetum*, mole-cricketts [*Gryllotalpa*] and wireworms, and also destroyed the germinating power of many weed seeds. It is sufficiently rich in nitrogen to make any additional nitrogenous manure unnecessary, and its insecticidal effect is probably due to the cyanides that it contains. Superphosphates treated with the residues from the refining of crude oil, at 6 cwt. to the acre, and crushed shale impregnated with shale oils, at 5½ cwt. to the acre, gave some measure of control, but were less effective than crude ammonia.

**GUILLOCHON (L.).** **Le pêcher dans le Nord de l'Afrique.**—*Vie agric. & rurale*, xxix, no. 52, pp. 407–408, 1 fig., 3 refs. Paris, 25th December 1926.

The cultivation of peaches in Algeria and Tunis is almost confined to early varieties that ripen in June and early July before the oviposition period of *Ceratitis capitata*, Wied. These varieties have soft flesh and are consequently unsuitable for export, so that the control of *C. capitata*, which would enable late ripening peaches to be grown, is of considerable importance. In addition to peaches, which are attacked in the summer and autumn, *C. capitata* damages apricots in the summer, apples in the autumn, and oranges in the winter; the control measures recommended are the collection and destruction of fallen fruit and the use of traps containing a bait closely resembling that in use in Western Australia [*R.A.E.*, A, xii, 411]. Where the shoots and young leaves of peach trees are injured by *Aphis amygdali*, Buckt. (*persicae*, Boyer), they should be sprayed with a solution of 1 oz. nicotine to 1 pint water in 8 gals. water containing 8 tablespoons sodium carbonate and 2–3 oz. soft soap; if the shoots are very heavily infested they should be cut off and destroyed.

**SEYRIG (A.).** **Observations sur les Ichneumonides (1<sup>re</sup> série).**—*Ann. Soc. ent. France*, xcv, pt. 2, pp. 157–172, 4 figs. Paris, 30th June 1926.

The author records finding large numbers of female Ichneumonids in oak forests at an altitude of about 3,250 feet in southern Spain, during the summer, and points out that their occurrence in that locality can

only be explained by assuming that they migrate there from the plains when the latter become too hot and dry for them in June. In a damp fissure in one of the mountains in the same district he found several hundred females of *Amblyteles armatorius*, Först., a common parasite of *Agrotis pronuba*, L., and *Euxoa* (A.) *segetum*, Schiff., in the plains, where both sexes are found in May.

[VUKASOVIĆ] VOUKASSOVITCH (P.). **Contribution à l'étude de *Pteromalus puparum*, L., Chalcidien parasite interne des chrysalides : sur les types aberrants chez *P. puparum*.**—*Ann. Soc. ent. France*, xcv, pt. 2, pp. 179–182, 3 refs. Paris, 30th June 1926.

In 1924 a severe outbreak of *Pieris brassicae*, L., occurred on cabbages in the neighbourhood of Belgrade (Serbia), and in the autumn the author collected a large number of pupae, 98 per cent. of which had been parasitised by *Pteromalus puparum*, L. These pupae invariably contained living larvae of *P. puparum* in addition to the cast pupal skins of the parasites that had already emerged. From pupae of *P. brassicae*, in which eggs of *P. puparum* were laid in March and April, adult parasites emerged from May to July, and in the latter month a few larvae still remained. When parasitised pupae were kept in a warm room in winter, many of the parasites died in the larval stage, while the others emerged after periods varying from two weeks to four months. When, however, they were placed out of doors the parasites emerged at the normal time in the following May. It therefore appears that certain larvae of *P. puparum*, sometimes more than half the total, have a delayed development comparable to the winter diapause of other insects, while others, hatching from eggs laid by the same female at the same time, develop rapidly. Constant high temperature is detrimental to these slowly developing larvae, which resemble those of insects of the type designated heterodynamic by Roubaud [*R.A.E.*, B, xi, 55]. The cause of retarded development must be assumed to be internal, unless, as is possible, it is lack of nourishment.

BROCHER (F.). **Observations biologiques sur *Psylla pyrisuga* (Hémipt.).**—*Ann. Soc. ent. France*, xcv, pt. 2, pp. 183–188, 1 fig., 1 ref. Paris, 30th June 1926.

The adults of *Psylla pyrisuga*, Först., appear [in Switzerland] towards the end of April, and the eggs are laid in groups on pear leaves that are just unfolding, usually along the central vein; each egg has a short peduncle that is inserted into the leaf tissue. The larvae hatch in a few days and feed for a short time on the leaves, which remain unexpanded, probably on account of the lesions produced by oviposition; they then move to the stems and feed in colonies in the axils of the leaves at the base of the new shoots, or sometimes on those of the previous year. They become full-grown in four weeks and then leave their colonies and transform into adults on the leaves. The adults that are produced in June are yellowish green, while those that appear in the spring are black, the females having several yellow or red spots. By the end of June all stages of the Psyllid have disappeared. It is generally supposed that the adults of *P. pyrisuga* hibernate in cracks in the bark of trees, but the author considers that the complete life-history is as yet unknown; happening to observe a newly emerged adult carried away from a pear tree into the ground by an ant, he placed several adults

close to a colony of larvae, which are visited by ants for the sake of their sugary excretions, although not interfered with by them, and saw that each one was picked up, after a short time, by an ant which carried it down the trunk and under ground. From these observations the author concludes that the rarity of adults of *P. pyrisuga* in June is accounted for by the fact that they are carried off by ants before they are able to fly. The presence of adult Psyllids in ant nests does not appear to have been recorded, but various other Homoptera, especially Jassids, have been found in them.

The larvae of *P. pyrisuga* are parasitised to a considerable extent by the Encyrtid, *Prionomitus mitratus*, Dalm., the adults of which emerge from the nymphs through a hole in the dorsal side of the abdomen. Parasitised nymphs remain attached to the stems, instead of migrating to the leaves. The author has never seen birds feeding on Psyllid larvae, and it is probable that they are distasteful.

FERRIÈRE (C.). **Un parasite de *Psylla pyrisuga*.**—*Ann. Soc. ent. France*, xcv, pt. 2, pp. 189–194, 2 figs., 16 refs. Paris, 30th June 1926.

In connection with the Encyrtid, *Prionomitus mitratus*, Dalm., recorded in the preceding paper as an important parasite of *Psylla pyrisuga*, Först., the author discusses the biology of allied species recorded in the literature, and points out that the genus *Psyllaephagus*, erected by Ashmead for two North American Encyrtids parasitic on Psyllids, is biologically very close to *Prionomitus*, and may be found to be synonymous. He gives a list of 8 other Chalcidoids that have been recorded from Psyllids.

MEIER (K.). **Gleichzeitige Bekämpfung von Schorf, sowie Obstmade und anderen fressenden Schädlingen.** [Simultaneous Treatment against Scab and the Codling Moth and other chewing Insect Pests.]—*Schweiz. Zeitschr. Obst- u. Weinbau*, xxxv, no. 25, pp. 420–422. Wädenswil, 11th December 1926.

For combating insect pests of apples such as the codling moth [*Cydia pomonella*] an arsenical may be added to the lime-sulphur spray used against scab. Though calcium arsenate is slightly less effective than lead arsenate, it is not so prone to precipitate in solution or to scorch the plant. The formula suggested is: 22 gals. lime-sulphur spray of  $2\frac{1}{2}$  per cent. strength and 14 oz. calcium arsenate, or 42–70 oz. lead arsenate.

MAYNÉ (R.). **Les Pissodes en Belgique.**—*Ann. Gembloux*, xxxii, pt. 10–11, pp. 234–245, 2 pls., 31 refs. Gembloux, 1926.

*Pissodes notatus*, F., *P. pini*, L., and *P. piceae*, Ill., are the only weevils of this genus known to occur in Belgium, and the last-named is only represented by two individuals. A list is given of common European species that might be introduced and established owing to the extension of forests of conifers, particularly *Picea*. The differences between the genera *Pissodes* and *Hylobius* are briefly described.

*P. notatus*, the stages of which are described, is a common pest of pines, especially *Pinus sylvestris*, *P. pinaster (maritima)* and *P. laricio*, and it has been found on *P. strobus* and *Picea* and sometimes attacks larch. It is a secondary pest, apparently never breeding in healthy trees. Although trees of four to eight years are preferred for oviposition, any weak or unhealthy tree may be infested. Newly felled trees

are also attacked. The adult has been recorded as living two or even three years. The length of the life-cycle, which is normally one year, may be modified by such local conditions as altitude, temperature, etc. The adults appear from April to June, and oviposition occurs from April to September. Although hibernation usually takes place in the adult stage, insects hatching from the later eggs may hibernate as larvae or pupae. The length of the period from egg to adult varies, according to different authors, from  $3\frac{1}{2}$  to 11 months.

The feeding of the adult on the shoots and young branches causes relatively little damage, although the tips may wither if the punctures are sufficiently numerous. Eggs are laid in holes bored in the bark, one or more in each according to the thickness of the stem. On young trees eggs are deposited near the base of the trunk, rarely higher than 3 ft., preferably at the axils of the branches, and sometimes just below the surface of the ground. On older trees oviposition takes place on the trunk, usually at a height of 3–6 ft. On hatching the larvae penetrate beneath the bark and make irregular tunnels in the bast; these radiate more or less if the eggs are laid in a heap and end in a pupal chamber extending into the sapwood. These galleries, which enlarge as the larvae develop, may be distinguished from those of Scolytids by their greater size, their irregularity and the absence of a parent burrow.

Trees injured by *Pissodes* are subsequently attacked by Scolytids, particularly *Ips* (*Tomicus*) *sexdentatus*, Boern., *I.* (*Pityogenes*) *bidentatus*, Hbst., *Hylastes palliatus*, Gyll., etc., and unless they are felled and removed at once, they may be attacked by *Xyloterus* (*Trypodendron*) *lineatus*, Oliv., the galleries of which penetrate deeply into the wood, greatly depreciating its value.

The usual control methods such as the maintenance of healthy stands, the planting of mixed stands, the protection of woodpeckers, the use of trap-trees, etc., are recommended. A list of the Hymenopterous parasites of *P. notatus* is given.

*Pissodes pini*, the stages of which are described, is very local in Belgium. It occurs on *Pinus sylvestris*, *P. laricio austriaca*, *P. strobus*, *P. pinaster* and *Picea*. It is even less attracted to healthy trees than *P. notatus*. The female prefers old trees with thick bark for oviposition. The adults are generally found in June but probably occur from May to September. Eggs are laid during the summer, and the larvae generally hibernate in their galleries, which radiate more regularly than those of *P. notatus*, pupating in the spring and emerging as adults towards the end of May. It is also probable that hibernation takes place in the pupal or adult stage. The damage done by this species and the control measures recommended are similar to those in the case of *P. notatus*.

*Pissodes piceae* chiefly attacks *Abies pectinata*, and it is probable that it is the relative scarcity of this tree that has prevented its spread.

VAN POETEREN (N.). **Verslag over de Werkzaamheden van den Plantenziektenkundigen Dienst in het Jaar 1925.** [Report on the Work of the Phytopathological Service in 1925.]—*Verslag. & Meded. Plantenziektenk. Dienst*, no. 44, 124 pp., 7 pls. Wageningen, December 1926.

Cereal pests in Holland in 1925 were *Tarsonemus spirifex*, Marchal, attacking oats; *Oscinella* (*Oscinis*) *frit*, L., on rye; and the larvae of a fly, probably *Hydrellia griseola*, Fall., mining the leaves of barley.

Beet pests included *Cassida nebulosa*, L., and *Silpha* sp., against which a spray containing 1 per mille Paris green and 1 per cent. milk of lime is advised; the adults of a weevil, *Cneorrhinus* (*Philopodon*) *plagiatus*, Schall., not previously known as a beetle pest; *Pegomya hyoscyami*, Panz., which was more harmful than usual; and *Tylenchus dipsaci*, Kühn (*devastatrix*, Kühn), which is rarely recorded on this crop in Holland. Stored canary-seed was infested by Lepidopterous larvae, probably those of *Coleophora ciconiella*, H.-S. Oaks were attacked by *Tortrix viridana*, L., and the flea-beetle, *Haltica erucacae*, Ol.; and ash by *Hylesinus fraxini*, Panz. Apple pests included *Chloroclystis rectangulata*, L., against which a spray of 8 per cent. carbolineum is suggested; *Blastodacna putripennella*, Zell., or *B. vinolentella*, H.-S., infesting the shoots; and the leaf-skeletoniser, *Hemerophila* (*Simaethis*) *pariana*, L. *Aphelinus mali*, Hald., the imported Chalcid parasite of the woolly apple aphid [*Eriosoma lanigerum*, Hausm.] survived the winter of 1924-25 and is increasing. *Tortrix* (*Cacoecia*) *rosana*, L., hollowed young peach fruits from within as well as feeding on the surface of the fruit and on the leaves. Black currants were attacked by *Pteroncus ribesii*, Scop. Owing to neglect in spraying with carbolineum one district lost about one-third of the raspberry crop through *Incurvaria* (*Lampronia*) *rubiella*, Bjerk. Grape-vine foliage was severely harmed by *Heliothrips haemorrhoidalis*, Bch. Pests of flowers included the gall-midges, *Dasyneura alpestris*, de Meij., on *Arabis alpina*, and *Cystiphora taraxaci*, Kieff., on *Taraxacum officinale*; *Subcoccinella vigintiquatuorpunctata*, L., on dahlia leaves; the larvae of *Otiorrhynchus* sp. on cyclamens and primulas; and *Strophosomus capitatus*, DeG., on roses. Cucumbers in frames were attacked by the Staphylinids, *Trogophloeus pusillus*, Grav., *T. bilineatus*, Steph., *T. elongatulus*, Er., and *Oxytelus rugosus*, F., which had probably bred in the horse manure used. Stems of iris were injured by the caterpillars of *Gortyna* (*Hydroecia*) *micacea*, Esp. The Chalcid, *Megastigmus spermotrophus*, Wachtl., was again abundant in seed of Douglas fir [*Pseudotsuga taxifolia*]. Attempts to disinfect the seed by exposing it for 5-15 minutes to dry heat at 51°-54° C. [123·8°-129·2° F.] were unsuccessful.

DE JONG (W. H.). **Smalle graanvlieg** (*Hylemyia coarctata* Fallén) en **fritvlieg** (*Oscinis frit* Fabr.).—*Verslag. & Meded. Plantenziektenk. Dienst*, no. 45, 22 pp., 1 pl., 1 fig., 7 refs. Wageningen, December 1926.

In 1926 there was a serious infestation of rye in Holland by *Hylemyia coarctata*, Fall. The observations made on this fly mainly agree with published information, which is reviewed. The spring was early and pupation occurred in April, about a fortnight before the usual time in Germany and Denmark. The pupal stage apparently lasted longer than usual owing to cool weather. The adults were seen early in June, some days before the date recorded in Germany and Denmark. The flight period ended between 10th and 15th August, a month earlier than recorded from Denmark in 1903-1923. The females do not oviposit at once, the eggs being laid in July and August when various crops have been mown and stubble-fields reappear. From observations made in experimental plots it is concluded that oats may be sown without danger in a field that has been infested, but should not be sown too early. Summer barley may also be sown, but at a very late date. Winter

grain crops should be as vigorous as possible, and early sowing assists this. The presence of a root-crop at the oviposition period causes the eggs to be laid elsewhere. Grass-fields must be ploughed later than August if an infestation by *H. coarctata* is threatened, but if danger be apprehended from *Oscinella* (*Oscinis*) *frit*, L., Tipulids or wireworms, ploughing must take place at the end of July or early in August. Stubble-fields should be ploughed without delay; those that have a green covering of weeds, etc., are preferred for oviposition.

The second part of the paper reproduces briefly published information from Britain and Germany on *O. frit*, in view of the possibility of confusion between the larvae of this species and those of *H. coarctata*.

VAN POETEREN (N.). **De berichtendienst van den Plantenziektenkundigen Dienst.** [The Report Service of the Dutch Phytopathological Service.]—*Verslag. & Meded. Plantenziektenk. Dienst*, no. 46, 17 pp. Wageningen, December 1926.

This is an account of the official reports on injurious insects, etc., and measures to be taken against them, published in the press or broadcasted in Holland.

S[CHENK] (P. J.). **De peregalmug.** [The Pear Gall Midge.]—*Floralia*, xlvii, no. 52, p. 819. Assen, 31st December 1926.

In Holland the pear gall-midge, *Contarinia pyrivora*, appears early in April and oviposits in the closed pear-buds. The larvae bore into the fruits and when mature, pupate in the ground. The second generation, which appears in May, does not attack the fruit; it hibernates in the pupal stage. *C. pyrivora* is rare or absent where the ground is sandy, but is common on heavy ground containing lime.

STEHLI (G.) et al. **Feinde der Land- und Forstwirtschaft. Ihre Biologie und Bekämpfung.** [Enemies of Agriculture and Forestry. Their Biology and Control.]—192 pp., 96 figs. Stuttgart, Kosmos Franckh'sche Verlagshandlung, 1924-1926.

This work comprises 96 two-page sheets, each dealing in a popular form with an injurious insect, the biology and control of which is briefly outlined. The sheets can be filed as in a card-index.

OUDEMANS (A. C.). **Acarologische Aanteekeningen lxxxiii.**—*Ent. Ber. Ned. Ent. Ver.*, vii, no. 151, pp. 144-147. The Hague, 1st September 1926. [Recd. December 1926.]

The mite, *Tyrophagus infestans*, Berl., is recorded as having attacked seedlings of rye and barley in Germany.

BAER (W.). **Ueber Käferfrass von Scolytus intricatus Rtzb.** [On *S. intricatus* feeding in the Adult Stage.]—*Zeitschr. wiss. Insektenbiol.*, xxi, no. 8-9, pp. 176-178. Berlin, 25th November 1926.

Adults of *Scolytus intricatus*, Ratz., are recorded in Germany as boring in one and two year old shoots of oak. This results in numerous twigs falling to the ground or remaining hanging on the tree in a broken state.

BREMER (H.). **Ueber die tageszeitliche Konstanz im Schlüpftermine der Imagines einiger Insekten und ihre experimentelle Beeinflussbarkeit.** [Constancy as regards the Time of Emergence of adult Insects and its Response to experimental Influences.]—*Zeitschr. wiss. Insekten-biol.*, xxi, no. 8-9, pp. 209-216. Berlin, 25th November 1926.

Experiments in Pomerania showed that the beet fly, *Pegomya hyoscyami*, Panz., emerges exclusively before noon. This applies also to its parasite, *Opius fulvicollis*, Thoms. The meal moth, *Ephestia kühniella*, Zell., usually emerges in the afternoon and evening. By keeping the pupae of *E. kühniella* in light by night and in darkness by day, a contrary result was obtained. Storage in continued darkness yielded practically the same results as under normal conditions.

BREMER (H.). **Ueber die Rübenfliegenplage und ihre Bekämpfung.** [On the Beet Fly Pest and its Control.]—*Illust. landw. Ztg.*, xlv, no. 14, reprint, 3 pp. Berlin, 2nd April 1926. [Recd. December 1926.]

The author's observations on the effect of climate on the beet fly [*Pegomya hyoscyami*, Panz.] have already been noticed [*R.A.E.*, A, xiv, 600]. Kleine has advocated late sowing in order that the fly may not find beet on which to oviposit [A, xi, 168], but in Pomerania the resultant short period of growth causes too great a decrease in yield for this method to be adopted. Sowing must, therefore, be done as early as possible so that vigorous plants may be present when the fly appears. Kemner's experimental results with a nicotine sulphate spray against the larvae [A, xiii, 539] are not applicable in practice owing to its cost. Of the methods tried against the adults that of spraying the plants with a solution containing sugar and arsenic has been found of practical value.

LANGHOFFER (A.). **Gubar i sušenje naših hrastovih šuma.** [The Gipsy Moth and the Destruction of our Oak Forests.]—*Annales pro Experimentis foresticis*, i, pp. 150-233, 108 refs. Zagreb, 1926. (With a Summary in German.)

The gipsy moth, *Porthetria* (*Lymantria*) *dispar*, is a very serious pest of oak forests in Jugoslavia. The egg-masses are usually laid on the trunks, but in serious infestations they are also found on the undersides of the branches. The first caterpillars appear in April, sometimes at the end of March. The oak is preferred, but many kinds of trees and other plants may be attacked, including even nettles, cereals and rushes, though the ash is only exceptionally infested. The first adults appear much earlier than in Central Europe, often in the middle of June. Natural factors of control include the polyhedral disease, the beetles, *Calosoma sycophanta*, *C. inquisitor*, and occasionally *Ocybus olens* and *Cantharis rustica*, Hymenopterous parasites and Asilid flies. The value of birds is doubtful. The artificial measures adopted are the scraping off of the egg-masses or painting them with tar, spraying against the caterpillars, and the destruction of the pupae.

The period elapsing between outbreaks is often less than ten years, and the outbreaks last from one to over three years. Prior to 1909 the loss due to defoliation was often limited to a reduction in growth and in the acorn and gall crops, but since the outbreaks of oak-mildew in 1909 many oaks have died, in many cases losses of 30–50 per cent., and even 90–100 per cent. in one instance, having occurred.

ZIMMERMANN (F.). *Naenia typica*, L., ein neuer Hopfenschädling aus Böhmen. [*N. typica* a new Pest of Hops in Bohemia.]—*Zeitschr. Pflanzenkrankh.*, xxxvii, no. 1–2, pp. 9–12, 3 figs. Stuttgart, 1927.

In Bohemia the leaves of hops, especially *Humulus japonica*, are skeletonised by the caterpillars of the Noctuid, *Naenia typica*, L. Larvae collected in August and fed on the leaves of wild hops and of *H. japonica* pupated early in October, the adults appearing in the breeding cages from the 18th October onwards. In nature, however, there is only one generation a year; the larvae hibernates and pupate on the surface of the ground in spring, the adults being present in June and July.

BÖNING (K.). Die Mosaikkrankheit der Rübe. [Beet Mosaic.]—*Zeitschr. Pflanzenkrankh.*, xxxvii, no. 1–2, pp. 19–25, 10 refs. Stuttgart, 1927.

This is a survey of existing knowledge on the mosaic disease of beet, which may sometimes lead to losses of 30 per cent. The mode of transmission requires further investigation. Hitherto infection has been communicated with certainty only by means of Aphids, and in Germany the spread of mosaic is closely related to the occurrence of these insects, especially *Aphis rumicis*, L. (*fabae*, Scop.).

ECKSTEIN (K.). Zur Lebensweise der Graurüssler. [A Contribution to the Life-history of the Grey Weevils.]—*Forstl. Zeitschr. Silva*, xiv, 1925, pp. 6–9. (Abstract in *Zeitschr. Pflanzenkrankh.*, xxxvii, no. 1–2, p. 46. Stuttgart, 1927.)

In Mecklenburg 8–10 year old trees of Sitka spruce [*Picea sitchensis*] lost their needles as a result of the shoots, especially at the tops, being attacked by the young adults of the weevil, *Strophosomus coryli*, and, more rarely, by those of *S. obesus*. Sitka spruce is a new food-plant for both species.

SCHWARTZ (—). Der Stand der Ausbreitung des Kartoffelkäfers in Frankreich im Herbst 1925. [The State of the Distribution of the Potato Beetle in France in the Autumn of 1925.]—*Nachrichtenbl. deutschen Pflanzenschutzdienst*, vii, no. 1, pp. 1–3, 3 maps. Berlin, January 1927.

This is a survey compiled from various French reports on the occurrence of the Colorado potato beetle [*Leptinotarsa decemlineata*] in France in the autumn of 1925.

SCHNEIDER (G.) & SIEGWARDT (W.). **Wirkung des bei der blinden Kartoffelkäferbekämpfung in den Boden gebrachten Neutralöls auf das Wachstum der nachgebauten Kulturpflanzen.** [The Action on subsequent Crops of neutral Oils used for demonstrating Soil Treatment against the Colorado Potato Beetle.]—*Nachrichtenbl. deutschen Pflanzenschutzdienst*, vii, no. 1, pp. 4-5, 1 fig. Berlin, January 1927.

In demonstrating soil disinfection methods such as would be needed against the Colorado potato beetle [*Leptinotarsa decemlineata*] the ground was wetted with coal-tar "neutral oils" [*R.A.E.*, A, xii, 438; xiii, 299; xiv, 466] at the rate of about 13 fl. oz. per sq. ft. Cereals, lupins, potatoes and beets were sown some months later on the treated ground and on adjacent control plots. No difference in the crop yield was noticed.

HILGENDORFF (G.). **Ueber die Normierung des Schweinfurtergrüns.** [On a comparative Standard for Paris Green.]—*Nachrichtenbl. deutschen Pflanzenschutzdienst*, vii, no. 1, pp. 5-7, 4 refs. Berlin, January 1927.

In view of the many brands of Paris green on the market in Germany, the desirability of a recognised standard of quality is suggested. The chemical qualities are stated and the physical ones, which are less easy to define, are discussed. In conclusion it is laid down that a suitable quality must not settle in the sulphurimeter in less than 45 minutes, must not be under 30 Chancel degrees, and must not contain more than 1 per cent. of water. The precipitate deposited in water must to the extent of at least 98.5 per cent. pass a "normal 6,400 sieve," *i.e.*, one with a mesh width of 0.075 mm. and a wire thickness of 0.050 mm. The arsenious oxide ( $As_2O_3$ ) content must be between 55 and 58.6 per cent. The cupric oxide ( $CuO$ ) content must be between 30 and 31.4 per cent. Water-soluble arsenite compounds must not be present to exceed 3.5 per cent. of  $As_2O_3$ . The colouring matter added to conform to German regulations must not be soluble in ether, must not act on iodine and must not exceed 0.5 per cent. in weight; otherwise the tests will be interfered with.

MÜLLER (A.). **Versuche zur inneren Therapie der Pflanzen.** [Experiments in the internal Treatment of Plants.]—*Anz. Schädlingssk.*, ii, no. 12, pp. 157-164, 2 figs., 4 refs. Berlin, 15th December 1926.

The experiments described here form part of work that has already been noticed [*R.A.E.*, A, xiv, 505].

KOVAČEVIĆ (Ž.). **Die angewandte Entomologie in Jugoslawia.** [Applied Entomology in Jugoslawia.]—*Anz. Schädlingssk.*, ii, no. 12, pp. 164-165. Berlin, 15th December 1926.

Applied entomology is making progress in Jugoslawia, but the number of entomologists is as yet quite insufficient to cope with the task of investigating the many special problems presented by such insects as the gipsy moth [*Porthetria dispar*] and by pests of tobacco, cotton and poppies. Popular education in applied entomology is being furthered by the publication of newspaper articles, bulletins, etc.

TORKA (V.). **Beobachtungen über die Eiablage von *Sirex spectrum* L. und den Schmarotzer *Rhyssa persuasoria* L.** [Observations on the Oviposition of *S. spectrum* and of the Parasite, *R. persuasoria*.]—*Anz. Schädlingsk.*, ii, no. 12, p. 166. Berlin, 15th December 1926.

Notes are given of observations on the wood-wasp, *Sirex spectrum*, L., and its parasite, *Rhyssa persuasoria*, L., found in Silesia ovipositing in *Abies pectinata*. The parasite was found to oviposit in the early larval stages of the host.

WERTH (E.) & others. **Krankheiten und Beschädigungen der Kulturpflanzen im Jahre 1921.** [Diseases and Injuries of Cultivated Plants in 1921 in Germany.]—*Mitt. biol. Reichsanst. Land- u. Forstw.*, no. 29, 245 pp. Berlin, October 1926. [Recd. January 1927.]

This report contains extensive annotated lists of the insect pests recorded in Germany in 1921, divided according to the class of crop attacked.

LOUNSBURY (C. P.). **[Report of the Chief, Division of Entomology, 1925-26.]**—*Farming in S. Africa*, i, no. 9, pp. 334-338, 1 fig. Pretoria, December 1926.

The eucalyptus snout beetle [*Gonipterus scutellatus*, Gyll.] has continued to spread in South Africa. *Eucalyptus viminalis*, the common species on the high veldt, is particularly liable to attack; susceptible trees, separated by miles of open grass land from other trees, are reached by flight of the insect. In winter drought areas the larva hibernates in the soil and consequently survives even heavy frosts, but appears to perish if the cell is broken by cultivation. Finely powdered calcium arsenate applied to plantations by aeroplane poisoned both larvae and adults without apparent harm to trees, but daylight periods of dry calm, necessary for the efficient distribution of the dust, occur so irregularly, and are of such short duration in the high veldt during the months when the insect could be controlled in this manner, that aeroplane dusting with the present equipment is impracticable as a commercial measure. Seven species of predacious bugs, presumably indigenous, have been found to destroy the larvae, and it is hoped to introduce an egg parasite from South Australia.

*Aphelinus mali*, Hald., is spreading naturally in many localities, but presumably for climatic reasons, has failed to establish itself in the Cape Peninsula. The parasite is ineffective in spring, but may control the woolly apple aphid [*Eriosoma lanigerum*, Hausm.] by midsummer, and so check outbreaks in seasons and in places when the Aphids are not killed naturally by heat. Local infestations by brown locusts [*Locus-tana pardalina*, Wlk.] occurred, although the main outbreak had passed. No occurrence of the red locust [*Nomadacris septemfasciata*, Serv.] was observed, although these usually follow outbreaks of the brown locust. The locust parasites studied include two that attack the adult, two that attack the egg and one that attacks both egg and adult.

*Earias insulana*, Boisd., and *E. biplaga*, Wlk., caused a few severe local outbreaks on cotton, but seemed to be controlled by parasites. It was found that the larva of the red (Sudan) bollworm [*Diparopsis castanea*, Hmps.] rejects the surface of the boll or other parts that it

cuts away to gain entrance, so that spraying or dusting have very little effect. Two Chalcid parasites were reared from eggs and one Chalcid and one Braconid from larvae, but the percentage of parasitism was low. Severe attacks of the American bollworm [*Heliothis obsoleta*, F.] occurred in some areas, but late in the season parasites and predators reduced the infestation. In one field 50–60 per cent. of the eggs were parasitised by two Chalcids. A Braconid and a Tachinid were reared from the larvae. Experiments proved that dusting with calcium arsenate and sodium fluosilicate were ineffective, and the increased yields after dusting and spraying with Bordeaux mixture were not sufficient to warrant the expense of treatment.

*Nicotiana rustica* is more susceptible to the tobacco slug [*Lema bilineata*, Germ.] than ordinary tobacco. About three acres systematically cleaned by hand crushing at long intervals, taking six labourers only half a day each time, resulted in a practically clean crop, when an untreated block was badly damaged by the insect.

The work of the plant inspection and quarantine service is briefly reviewed. Pests intercepted were chiefly scale-insects and Aphids, including the root woolly pear aphid [*Eriosoma pyricola*, Bak. & Dav.] found in large consignments of pear stocks.

Pernicious scale [*Aspidiotus perniciosus*, Comst.] has been reported from several new districts, but has not yet become established in Cape Province. Red scale [*Chrysomphalus aurantii*, Mask.] is spreading in the citrus nurseries of the Transvaal, while Ross scale [*Chrysomphalus rossi*, Mask.] is becoming common in Cape Province. Several severe outbreaks of the common citrus mealybug [*Pseudococcus citri*, Risso] occurred in the Transvaal and the Cape, and heavy losses resulted in spite of the control measures taken. *Cryptolaemus* [*montrouzieri*, Muls.] is to be liberated in an estate heavily infested with this pest.

WILLIAMS (R. H.). [**Locust Administration.**].—*Farming in S. Africa*, i, no. 9, pp. 339–340. Pretoria, December 1926.

The locust campaigns carried out during 1925–26 are reported on as in previous years [*R.A.E.*, A, xiii, 112; xiv, 121]. The infested area in each territory (with the exception of Cape Province) was considerably smaller than in the previous season, though the infestation was very intense, especially in Cape Province.

In the Union and Bechuanaland Protectorate the first hatchings occurred in the early part of September, and by the end of December the main collections of eggs had all hatched and been dealt with. Minor hatchings occurred in January and February in those districts in which no rain had previously fallen, but these were easily controlled. The campaign in South-West Africa was not completed until the end of May, owing to the lateness of the rainy season and the intermittent manner in which the rain eventually fell.

In all, 390,486 swarms were destroyed at a cost of approximately £217,000, and since only a very few swarms reached the winged stage, the campaign may be regarded as a success. During the season 237,122 gallons of concentrated liquid poison and 350 tons of sodium arsenite powder were issued. Excellent results have been obtained with the powder both dry and in the form of spray (3 oz. to 4 gals. water), and in view of the fact that the cost of transport is so much less than that of the liquid poison the latter will no longer be manufactured.

HALL (W. J.). **Contribution to the Knowledge of the Coccidae of Egypt.**  
—*Minist. Agric. Egypt, Tech. & Sci. Serv., Bull.* 72, 41 pp., 13 pls.  
Cairo, 1926. [Recd. January 1927.]

The twenty species dealt with in the first part of this paper bring the number of Coccids recorded from Egypt up to 123. The new species described are: *Monophlebus gymnocarpi*, on *Gymnocarpus decander* and other trees; *Phenacoccus cyperi*, on *Cyperus* sp.; *P. zillae*, on *Zilla spinosa*; *Pseudococcus alhagii*, on roots of *Echinops spinosus* and *Alhagi maurorum*; *Ripersia artemisiae*, on roots of *Artemisia monosperma*; *Tryonymus angustifrons*, on roots of *Ambrosia maritima* and *Sonchus oleraceus*; *Aclerda panici* and *Odonaspis panici*, on *Panicum turgidum*; *Ctenochiton artemisiae*, on roots of *Artemisia judaica*; *C. haloxyloni*, on roots of *Haloxylon schweinfurthi*; *Aspidiotus artemisiae*, generally on roots of *Achillea fragrantissima* and *Artemisia* spp.; *Cocomytilus farsetiae*, on *Farsetia aegyptiaca*; *C. retamae*, on *Retama raetam*; and *Targionia haloxyloni*, on *Haloxylon schweinfurthi*.

Additional information is given on species already recorded [*R.A.E.*, A, x, 494; xii, 196, 565; xiv, 119], with lists of the 123 species of Egyptian Coccids and of additional food-plants.

MÎÈGE [E.]. **La culture du tabac pour la nicotine.**—*C.R. Acad. Agric. France*, xiii, no. 4, pp. 135–138, 10 refs. Paris, January 1927.

The nicotine content of the different varieties of tobacco grown in various localities in North Africa and the factors that may influence it are discussed, largely from a review of the work of other authors. In Morocco varieties of *Nicotiana rustica* contain a higher percentage of the alkaloid than those of *N. tabacum*.

GENIEYS (P.). **Les fumigations à l'acide cyanhydrique en arboriculture.**  
—*Rev. hortic. Algérie*, xxx, no. 12, pp. 265–268. Algiers, December 1926.

The Italian Sansone-Grilli method of fumigation of several trees under one tent is described [*R.A.E.*, A, xiv, 569]. This has proved very efficacious against Coccids and other pests, a great advantage being that with a staff of 3 operators under a supervisor, with 4 large tents and 8 generators, from 500 to 600 trees a day can be treated, or even from 700 to 800 if they are not too widely spaced. The treatment should be made for preference at the end of summer and in autumn for orange trees, during outbreaks of Aphids, etc. The tents are thrown over the trees by means of poles higher than the trees and the fumigation process lasts from 40 minutes to an hour. The apparatus consists of a wooden barrel in which is placed the necessary water and sulphuric acid. The lid of the barrel swings on a pivot, which can be worked from outside the tent, and on it is placed a box containing the sodium cyanide. This apparatus is placed either inside the tent or outside with a tube connecting with the interior, and when the tent has been closed as closely as possible the cyanide is tipped gradually into the liquid below. The gas is thus liberated slowly and the fumigation is progressive, without danger of scorching the trees. If this operation is performed on a large scale by a syndicate, treatment once in 3 years should be sufficient to maintain the trees in healthy condition.

**Mesure à prendre contre le ver des cerises.**—*Rev. hortic. Algérie*, xxx, no. 12, pp. 277–278. Algiers, December 1926.

In view of the embargo placed by the British Government on cherries from France on account of possible infestation with *Rhagoletis cerasi* (cherry fruit-fly), it is suggested that similar measures should be taken to prevent the introduction of this pest into Algeria, where it does not as yet occur.

**TROUVELOT (B.). L'origine des déformations pierreuses des poires en France et recherches sur les moyens de prévenir le dégât dans les vergers.**—*C.R. Acad. Agric. France*, xii, no. 38, pp. 1024–1029, 3 figs. Paris, 1926.

This is a more detailed study of the damage done to pears in France by the Capsid, *Calocoris fulvomaculatus*, DeG. [*R.A.E.*, A, xiii, 541]. In 1924, half the crop in one large orchard in Seine-et-Oise was rendered unsaleable by this insect. The larvae hatch at the end of April, and at first the young, unfolding leaves are attacked, without, however, any appreciable effect on the tree. As soon as the blossom has disappeared, the larvae attack the newly set fruits, puncturing them especially at the base of the peduncle. In June the fruit is no longer attacked, the young shoots only being slightly damaged; by mid-July the insect becomes adult and by the end of the month has disappeared. Careful investigation has demonstrated that it is the punctures made in April or May by the young larvae that cause all the later disfigurement to the fruit, which, when ripe, shows hollowed areas containing small stony formations surrounded by hardened cells. Nicotine sulphate and soap sprays were used against the larvae, the greatest care being taken to cover the whole tree thoroughly by means of a fine jet. It was found that trees sprayed on 22nd April or 1st May yielded 50 per cent. of marketable fruit as compared with 10 per cent. in untreated plots. Spraying on 15th April was apparently too early, and on 3rd May too late to give good results. The practice of this treatment regularly for several years throughout an infested area is probably essential for permanent control.

**HICKEL (R.). L'emploi des avions pour la destruction des insectes nuisibles.**—*C.R. Acad. Agric. France*, xiii, no. 3, pp. 90–95. Paris, January 1927.

The Forest of Haguenau in France has recently been attacked by *Bupalus (Fidonia) piniarius*, L., which infested an area of about 100 acres at the end of 1924 and more than 2,200 acres at the beginning of 1926. Owing to the seriousness of the outbreak and the scarcity of labour, the usual remedial measures proved inadequate. It was therefore decided to try dusting by aeroplane, a method not previously employed in France.

The experiment took place over a total area of about 130 acres, the sections to be dusted being marked out in panels with pennons and fires at the corners. Owing to various delays the work could not be carried out until the end of October, when some of the larvae had already descended to the ground to pupate. Flying between 32 and

48 feet above the tops of the trees gave the best results. Calcium arsenate used at the rate of about 22 lb. to the acre destroyed about 35 per cent. of the larvae.

It is concluded that by using an aeroplane at the beginning of an outbreak, between mid-July and the end of September, or mid-October at the latest, and operating over large areas from a landing field near by, it would be possible, in conjunction with the feeding of pigs in the forest and the removal of litter, to control this moth effectually.

MORGAN (D. O.). **Investigations on Eelworm in Potatoes in South Lincolnshire.**—*Jl. Helminthology*, iii, no. 5, pp. 185–192. London, December 1925.

A local failure of the potato crop, which has occurred for several years in South Lincolnshire, was found in 1924 to be due to *Heterodera schachtii*, early and second varieties of potatoes suffering most. Investigations to test the effect of various chemicals on the Nematode and the susceptibility of several early varieties of potatoes were of little value, as other factors, including the fungus, *Rhizoctonia solani*, contributed to the failure of crops on the experimental plots. It appears, however, that dressing the soil with potash, salt or naphthaline gives slightly better results than with sulphur, lime, nitrolim or bleaching powder, and certain varieties of potato are rather less susceptible to the Nematode than the variety commonly grown in the district.

GOODEY (T.). *Tylenchus hordei* Schøyen, a Nematode Parasite causing Galls on the Roots of Barley and other Gramineae.—*Jl. Helminthology*, iii, no. 5, pp. 193–202, 1 pl., 4 figs., 6 refs. London, December 1925.

*Tylenchus hordei* was discovered by Schøyen to be a pest of barley in Norway in 1885. Closely similar galls had been found previously on the roots of *Elymus arenarius* by Warming in Denmark and by Trail in Scotland, the former believing them to be due to *Heterodera schachtii*, and the latter to a species of *Tylenchus*. According to Schøyen the Nematode attacks young plants and causes them to turn yellow. Those heavily infested die without making shoots, and the others become weak and deformed. The roots bear nodules of irregular shape, which contain all stages of the Nematode, and it is clear that there are several generations a year. He recommended that crop rotation should be tried. The author has succeeded in infecting barley with larvae of *Tylenchus hordei* from root-galls of *E. arenarius*, which supports Schøyen's suggestion that the infestation of barley in Norway had probably spread from this grass to cultivated plants. The author also found *Poa annua* to be susceptible to attack by *T. hordei*.

GOODEY (T.). *Hexatylus viviparus* gen. et sp. nov., a Nematode found in a diseased Potato Tuber.—*Jl. Helminthology*, iv, no. 1, pp. 27–30, 2 figs., 3 refs. London, March 1926.

*Hexatylus viviparus*, gen. et sp. n., found in one diseased tuber among a large number examined for *Tylenchus dipsaci*, is described. It was not observed to attack healthy tissue. Only females were found.

MORGAN (D. O.). **Some Remarks on the Etiology of Potato Disease in Lincolnshire.**—*Jl. Helminthology*, iv, no. 2, pp. 49–52. London, May 1926.

Observations in 1925 on the infestation of potatoes by *Heterodera schachtii* in South Lincolnshire support the view that the problem is primarily one of obtaining more suitable conditions for plant growth by judicious manuring and a system of rotation.

PETERS (B. G.). *Heterodera schachtii* (Schmidt) and Soil Acidity.—*Jl. Helminthology*, iv, no. 3, pp. 87–114, 14 refs. London, August 1926.

The possibility of correlating the acidity of the soil with the distribution of cysts of *Heterodera schachtii* is investigated by hydrogen-ion determination, the form of this Nematode that infests potatoes in South Lincolnshire being used. The question of the actual damage done to potato by it is still unsettled, but if it should be found that control methods are necessary, the author considers that a soil, a solution of which, prepared as specified, gives a pH value of 7.0 or over, would be unfavourable to the pest. It is probable that the adequate liming of sour soils would greatly reduce its prevalence.

An account of the life-history of this Nematode is included.

HODSON (W. E. H.). **The Azalea Leaf Miner, *Gracilaria azaleella* Brants.**—*Jl. R. Hort. Soc.*, lii, pt. 1, pp. 54–59, 2 pls., 3 refs. London, January 1927.

The Tineid, *Gracilaria azaleella*, Brants, which attacks azaleas, was first noticed in greenhouses in Britain in 1925 [*R.A.E.*, A, xiv, 51], and it is undoubtedly increasing rapidly. In the summer of 1926 it was observed out of doors in Devon and it had probably passed the winter in the open. A brief note on its distribution is given, together with a description of the various stages and the nature of the injury caused [*R.A.E.*, A, xii, 542]. The female deposits eggs singly on the undersides of the leaves along the side of the midrib or one of the veins, usually 1–5 on a leaf, but occasionally more. Forty eggs were obtained from one female in captivity. The larva, which hatches in 4 days, enters the leaf beneath the egg and mines between the upper and lower surfaces. When about one-third grown, it leaves the tunnel and travels to a fresh leaf, which it curls over at the tip, feeding inside the cavity. Several fresh leaves may be thus attacked. When the caterpillar is fully grown, the side of an undamaged leaf is drawn up longitudinally and the cocoon spun inside. In this case a new leaf is probably used to ensure the moth emerging on the plant, as mined or curled leaves very frequently shrivel and fall. The moth emerges after a short period and the life-cycle is completed in about 2 months, whether in a heated glasshouse in winter or a cool house in summer, so that there are probably four or five broods in a year.

The removal of all injured leaves gives satisfactory control where there are only a few plants. A spray of  $\frac{1}{2}$  lb. lead arsenate powder to 10 gals. water is recommended for use out of doors, its efficiency depending entirely on the thoroughness with which the leaves are covered, especially the lower surface, and the length of time that the poison remains on the leaves, the caterpillar being vulnerable only when it

seeks a fresh leaf. Repeated applications of a spray consisting of 1 oz. nicotine and 4 oz. soap to 10 gals. water proved an almost complete failure. Fumigation with 5 oz. calcium cyanide to 1,000 cu. ft. for 14 hours was not satisfactory (as in no case were all the larvae killed), and any increase in the quantity of the cyanide is apt to injure the plants.

Fumigation was also carried out in boxes; the advantages of this method are that leakage of gas is avoided, the removal of a large number of plants from a mixed greenhouse is unnecessary, and the operation can be carried out in the dark even during the daytime. A convenient internal measurement is 5 ft. square by 8 ft. high giving a capacity of 200 cubic feet. Well seasoned wood should be used, the joints should be made gas-proof, and trap doors should be fitted to insure thorough ventilation after fumigation.

Fumigation with tetrachlorethane was much more successful;  $\frac{1}{4}$  pt. of the liquid to 1,000 cu. ft. with a temperature varying from 50–70° F., fairly dry air, and an exposure of 14 hours, was found to kill all adults and larvae and some of the more mature pupae. The eggs and many of the pupae, however, escaped, and several fumigations at intervals of 14 days are necessary to eradicate the pest. This liquid is far less dangerous to human beings than cyanide, it is easily stored, handled and measured, and for fumigation needs simply to be poured on to the floor. Provided that the usual precautions are observed and the plants are fairly damp at the roots, scorching need not be feared.

THEOBALD (F. V.). **Some Soil Insects and their Treatment.**—*S.E. Agric. Coll., Res. & Adv. Dept.*, Bull. 5, 6 pp. Wye, Kent, January 1927.

A popular account is given of the chief soil insects attacking crops and the methods used for their control. *Tipula oleracea*, L. (common crane-fly), *T. paludosa*, Mg. (marsh crane-fly) and *Pachyrrhina maculosa*, Mg. (yellow-spotted crane-fly) occur in fields and gardens and on roadsides in summer, particularly in damp and badly drained spots, and are perhaps more prevalent in grass than arable land. The eggs are laid in the soil or on the surface of grass land. The larvae feed through the winter, remaining below ground during the day but coming to the surface at night, especially when it is warm and damp. The pupa forces its way partly out of the soil, and the adult emerges some time between May and September. The larvae attack root crops, cereals, garden produce, strawberries and grass.

A poison bait made by mixing 1 lb. Paris green with  $1\frac{1}{2}$  bushels bran and made into a fairly dry mash is recommended. This amount (or better still, two bushels) to the acre should be broadcast towards evening, and works best if used on a warm, damp night. Finely crushed crude or commercial naphthaline, broadcast at the rate of 2 cwt. to the acre and ploughed or dug in, may also be used; it is most effectual when followed by rain. This substance may, however, be harmful in bright light, especially to seedlings, and is known to damage strawberries.

Cutworms, especially the larvae of *Feltia (Agrotis) exclamationis*, L. (heart and dart moth) and *Euxoa (A.) segetum*, Schiff. (turnip moth), attack root crops, potatoes, cereals and many garden plants. The moths appear in June and July and lay their eggs in clusters on leaves near the soil or actually on the soil. The larvae eat into potato tubers and feed throughout the winter, pupate in early summer and

emerge about two weeks later. They may be controlled by the above-mentioned poison bait or, in potato fields, by allowing poultry to run there when the potatoes are being lifted.

The grubs of *Melolontha melolontha*, L. (*vulgaris*, F.), *Amphimallus* (*Rhizotrogus*) *solstitialis*, L., and *Phyllopertha horticola*, L., feed on the roots of all plants, but prefer grass-land. They live in the soil for three years, two years and one year respectively. Naphthaline will destroy these pests where it can be ploughed or dug in, but in grass-land, only very heavy rolling has been found effective.

Wireworms take from 3-5 years to mature, and they feed during the greater part of this time on roots, potato tubers, etc. They usually work near the surface of the soil. The beetles prefer land thickly covered with vegetation for oviposition, so that the larvae are most abundant in permanent pasture and clover ley. Control measures are : drilling artificial manure with the seed ; heavy ring-rolling both ways ; the use of naphthaline or some other soil insecticide ; and trapping the beetles in heaps of clover or lucerne covered with tiles or boards in May, June and July, and burning the heaps every ten days. When grass-land or clover ley is being broken up, it is advisable to turn sheep into the field, later giving a dressing of naphthaline and ploughing it in. If possible, it is best to grow a first crop of mustard and to graze sheep on it.

WOODMAN (R. M.). **The Solubility of some likely Spray Substances in Solvents containing Soap. The Preparation of Spraying Emulsions.**—*Jl. Agric. Sci.*, xvii, pt. 1, pp. 44-59, 25 refs. Cambridge, January 1927.

The material for making dilute oil emulsions may be either a concentrated emulsion of oil in a solution of an emulsifier such as soap, prepared by mechanical means, or a solution of oil in the emulsifier, the latter type including the proprietary coal tar washes. In each case it is essential that the concentrated preparation should be able to be diluted easily with water. The author has previously found that clear solutions containing relatively large amounts of paraffin oil can be prepared by dissolving the paraffin in a solution of cresylic acid and soap, which is similar to the "cresoap" used in the United States [*R.A.E.*, A, xiv, 270]. Such a solution of paraffin, when poured into water, gives either a solution or a mixed solution and stable emulsion, according to the amount of paraffin present.

This paper records the results of experiments to determine the solubility of paraffin oil, benzene, filtered anthracene oil ("green oil") [*R.A.E.*, A, xiv, 643], coal-tar creosote, and aniline, in solutions of soap (potassium oleate) with or without the addition of phenol, cresylic acid (a mixture of o-, m- and p- cresols), hexalin (obtained by hydrogenation of phenol), methyl-hexalin (obtained by hydrogenation of the cresols) or pyridine.

Spray fluids containing paraffin oil, benzene, and aniline in solution are economically possible, but coal-tar fractions such as anthracene and creosote oils, although soluble to a limited extent, especially with the use of hexalin, would be too dear for practical use as solutions and must be applied as emulsions. The best substance for admixture with potassium oleate for aiding the solution of paraffin oil is cresylic acid, the next best being hexalin. It appears, however, that the inclusion of cresylic acid in a spray may result in injury to foliage, so that the more expensive, hydrogenated phenol, hexalin, is in that respect preferable,

as the hydrogenated phenols are non-corrosive ; moreover they have decided insecticidal properties. If cresylic acid is employed, a dilute non-creaming emulsion, containing the same amount of oil but less cresylic acid, might be made instead of a solution. The solubility of aniline in soap solution is lessened by the addition of the hydroxyl compounds, but is increased by pyridine in quantities greater than 8 cc. per cent. ; a dilute pyridine-aniline spray in soap solution should prove a fairly effective contact insecticide, and would perhaps also be effective as a stomach poison and an egg wash.

Experiments were made to determine the influence of temperature on emulsification when using soap (sodium oleate) and gelatine as emulsifiers. With soap a rise in temperature facilitates the formation of emulsions, and it is suggested that concentrated soap emulsions should be made at a temperature of about 60° C. [140° F.]. With gelatine a rise in temperature up to about 30° C. [86° F.] facilitates emulsification, but a further rise makes it more difficult, so that emulsions with gelatine should be made at a temperature between that and 25° C. [77° F.]. The cause of the different behaviour of soap and gelatine is discussed, and an explanation is suggested.

A lighting paraffin oil, such as is often used in paraffin emulsions for spraying, was subjected to fractional distillation, and it was found that only 11.43 per cent. did not boil at 250° C. [482° F.], showing that this oil, which conformed well with the standards required for lighting, was not suitable for spraying, as according to Pickering, paraffin oil should contain at least 40 per cent. boiling above 250° C. to be an efficient insecticide.

BERRO (J. M.). **El "hilandero" o "barrenilla" de las uvas de embarque** (*Polychrosis botrana*, Schiff.). [The Caterpillar of Grapes for export, *P. botrana*.]—*Estac. Pat. veg. Almería*, Divulgación, 56 pp. Almería, 1926. [Recd. January 1927.]

The Tortricid, *Polychrosis botrana*, Schiff., is a serious pest of grapes grown in Almería for export. Not only is part of the crop lost, but if injured grapes are packed, the entire contents of a barrel may rot. *Clysia* (*Conchylis*) *ambiguella*, Hb., has not yet been found in Almería. Light-traps are useless against *P. botrana*, the adults of which are active only in the twilight. The egg stage lasts 8-10 days for the first generation, 6-8 for the second, and 5-6 for the third. Adults from the hibernated pupae emerge about the second half of April and oviposit at the end of April or early in May. The larvae of the first generation attack the flower-buds and pupate either in the bunch of young berries or on the foliage. The adults appear at the end of May or early in June. The larvae of the second generation attack the young grapes. Those of the third hatch in the second half of August and are the most harmful, because the grapes are so ripe that any injury produces fermentation causing the caterpillar to attack one berry after another without entirely consuming any of them. These larvae hibernate in any sheltered situation and winter measures consist in removing all possible refuges, and using shelter-bands and other traps. Against the first generation a lead arsenate spray, containing 3 lb. neutral lead acetate, 1.1 lb. anhydrous sodium arsenate and 100 gals. water or Bordeaux mixture should be used. A spray of 1 lb. 40 per cent. nicotine sulphate and 80 gals. Bordeaux mixture is advised against the second generation. Against the third, pyrethrum dust (1 part to

3 of lime or 4 of flowers of sulphur) is the best insecticide. Notes are given on the cultivation of pyrethrum, for which conditions in Spain are very suitable.

Two Braconids, *Ascogaster rufidens*, Wesm., and *Agahis* sp., and an Ichneumonid, *Omorgus difformis*, Gmel., occur in Almeria, all three being known parasites of *P. botrana*; but its principal parasite, *Dibrachys affinis*, Masi, has not yet been observed, and the abundance of *P. botrana* is possibly connected with its absence. It is suggested that the three generations of the vine-moth are insufficient to maintain the possible eight generations of *D. affinis*. Another host of the latter, *Apanteles glomeratus*, L., which parasitises the cabbage butterfly, *Pieris brassicae*, L., occurs in Almeria, and a few cabbages should be planted in the vineyards, so as to ensure host material for *D. affinis* being available at all times.

RONDELLI (M.). **La simbiosi ereditaria negli Eriosomatini.** [Hereditary Symbiosis in the Eriosomatinae.]—*Ricerche Morf. e Biol. animale*, i, no. 1, reprint, 32 pp., 3 pls. Naples, 1926. [Recd. January 1927.] (With Summaries in English and French.)

This is a study of the mycetom or symbiotic organ and its relation to parthenogenetic reproduction in the Aphids, *Eriosoma lanigerum*, Hausm., *E. lanuginosum*, Hartig, and *Tetraneura rubra*, Licht.

SILVESTRI (F.). **Necessità di rafforzare la lotta contro i parassiti delle piante e criteri da seguire.** [The Need for intensifying Work against Insect and Fungus Pests of Plants and the Principles to be followed.]—*Nuovi Ann. Agric.*, vi, pp. 89-96. Rome, 1926. [Recd. January 1927.]

In view of the proposed increase in the funds of the agricultural stations in Italy, the need for all forms of plant protection work is emphasised. It is pointed out that the staff of an experiment station should include specialists in agricultural chemistry, botany, pathology and entomology, since their co-operation is required for the proper study of the factors injurious to plants. Other matters calling for development are the encouragement of the production of efficient insecticides, including in particular the cultivation of pyrethrum, which is not grown in Italy as yet, and the methodical application of measures of biological control.

SILVESTRI (F.). **Lotta contro alcune cocciniglie degli agrumi.** [Work against some Coccids of Citrus Plants.]—*Nuovi Ann. Agric.*, vi, pp. 97-101. Rome, 1926. [Recd. January 1927.]

The Coccid pests of *Citrus* in Italy include, in order of importance, *Chrysomphalus dictyospermi*, Morg., *Lepidosaphes pinnaeformis*, Bch., and *Parlatoria zizyphus*, Lucas, while *Ceroplastes sinensis*, Del Guerc., and *Chrysomphalus* (*Aonidiella*) *aurantii*, Mask., are spreading. *C. dictyospermi* is parasitised by *Aphelinus chrysomphali*, Merc., and less commonly by *Aspidiotiphagus citrinus*, Craw, and *Prospaltella maculata*, How., while the Coccinellids, *Chilocorus* [*bipustulatus*, L.] and *Rhizobius* [*lophantae*, Blaisd.], prey upon it. The control exercised by these insects and by the parasite, *Aspidiotiphagus* [*lounsburyi*, Berl. & Paoli] introduced from Madeira [*R.A.E.*, A, xi, 70] is insufficient. During

a recent tour in the Far East, the author found that *C. dictyospermi* occurs in China in the Yangtze basin and is there kept down by *Comperiella* sp., *Aphelinus* and the Coccinellids, *Scymnus* and *Chilocorus*. Some specimens were sent from China to California; others were brought to Italy and released at Portici in December 1925. The only natural enemies of *L. pinnaeformis* in Italy are *C. bipustulatus* and a mite that destroys the eggs. The introduction from Tonkin of a Chalcid, *Casca chinensis*, How., and also of a Coccinellid is suggested. *P. zizyphus* has no special parasites in Italy. In China it is the most common Coccid on *Citrus*, though *Aspidiotiphagus* sp. and *Aphelinus* sp. exercise a certain amount of control. *Ceroplastes sinensis* has no active enemies in Italy; the author failed to find it in China, and suggests that it is a native of South America. *Chrysomphalus aurantii*, which is so harmful in California, is limited to a few districts in Italy. It must continue to be kept from spreading by artificial measures, but preparations for natural control should be made. Its parasites in the Far East include the species of *Comperiella* already mentioned, *Aphelinus* spp., *Prospaltella*, and (in Japan) *Casca* sp.

ZACHER (F.). **Was wissen wir vom Messingkäfer?** [What do we know of *Niptus hololeucus*?]—*Mitt. Ges. Vorratsschutz*, iii, no. 1, pp. 2-9, 1 fig. Berlin, January 1927.

This is a review of the existing knowledge on the Ptinid, *Niptus hololeucus*, Fald., which of recent years has become a household pest in Germany. This beetle feeds in the adult stage. The young adults remain for a long period, and nearly finish ovipositing, at the place where the larvae lived and pupated. It is the older individuals that wander and cause the chief injury. The pest may usually be controlled by fumigation.

TITSCHACK (E.). **Die Bedeutung der Temperatur für die Haus- und Speicherschädlinge.** [The Importance of Temperature for Household or Warehouse Pests.]—*Mitt. Ges. Vorratsschutz*, iii, no. 1, pp. 12-14. Berlin, January 1927.

This paper on the effect of temperature on the clothes moth [*Tineola biselliella*, Hum.] has already been noticed under another title [*R.A.E.*, A, xiii, 317].

BREMER (H.). **Die Ueberwinterung des Rübenaskäfers, *Blitophaga opaca*, L.** [The Hibernation of the Beet Silphid Beetle, *B. opaca*.]—*Anz. Schädlingssk.*, iii, no. 1, pp. 1-5, 6 refs. Berlin, 15th January 1927.

The Silphid, *Blitophaga opaca*, L., is an endemic pest of beet in North Germany, but though occurring in large numbers locally, it is not generally distributed. Hibernation takes place in the adult stage in sunny, warm, dry, loose ground with a moderate cover, so that the presence of light soil and large wooded or shrubby areas near the beet fields are necessary for the beetle.

The beet leaf bug, *Zosmenus* (*Piesma*) *quadratus*, Fieb., hibernates in the adult stage, and hibernation conditions influence its abundance [*R.A.E.*, A, xiv, 309], whereas the beet-fly, *Pegomyia hyoscyami*, Panz., winters as a pupa and is to a great extent independent of hibernation conditions [A, xiv, 32].

KRIEG (H.). **Zur Flugzeugbekämpfung des Eichenwicklers (*Tortrix viridana*, L.) mit Kalziumarseniat.** [Work with Aeroplanes and Calcium Arsenate against *T. viridana*.]—*Anz. Schädlingssk.*, iii, no. 1, pp. 5–7. Berlin, 15th January 1927.

The extensive oak forests of Westphalia and adjoining regions have been severely injured during the past decades by *Tortrix viridana*, L., and by fungi that occur after an outbreak of the moth. In view of a threatened defoliation it was decided in 1926 to dust about 4,700 acres with calcium arsenate from an aeroplane. On 7th and 8th May about 250 acres at Hödingen (Bischofswald) were dusted, about 18 lb. of a calcium arsenate containing 24 per cent. of arsenic being used to an acre. Up to the 9th May the temperature was low, varying between 2·4° and 14·6° C. [36·3° and 58·3° F.]. On the 9th and 10th heavy rain washed away most of the poison. Examinations made on the 10th and 11th revealed a mortality of 80 per cent. The dead caterpillars were found inside their rolls, very few having fallen to the ground. This result was not so satisfactory as one observed at Sorau in the previous year, but on that occasion the temperature was 25°–30° C. [77°–86° F.], the caterpillars were well-grown and feeding voraciously, and rain did not affect the action of the poison. On the 14th the work was resumed and with a rise in temperature a mortality of 100 per cent. was attained. In another area, Haste, work was done between 22nd and 31st May and on 7th June, the temperature, varying between 5·5° and 21·5° C. [41·9°–70·7° F.], being mostly high. In spite of showers every second day the result was successful, showing that if the temperature is high a full effect can be achieved in one day. Even at Hödingen under most unfavourable conditions the danger of defoliation was averted, and the few surviving caterpillars were likely to be cleared off by natural enemies. It is always best to dust when the temperature is 15° C. [59° F.] or over, as only then are the caterpillars feeding very actively. At Haste 30 per cent. of the infestation was by *Hybernina defoliaria*, Cl., and its larvae were killed more rapidly than those of *T. viridana* in their rolls, though in experiments the latter proved more susceptible to the insecticide.

BLEDOWSKI (R.). **Angewandte Entomologie und Pflanzenschutz in Polen.** [Applied Entomology and Plant Protection in Poland.]—*Anz. Schädlingssk.*, iii, no. 1, pp. 8–10, 1 fig. Berlin, 15th January 1927.

This is a brief account of the organisation of applied entomology and plant protection work in Poland.

[VUKASOVIĆ] VOUKASSOVITCH (P.). **Observations sur les parasites et hyperparasites d'*Hyponomeuta malinellus*, Zell.**—*C.R. Soc. Biol.*, xcvi, no. 3, pp. 170–172. Paris, 28th January 1927.

Brief notes are given on the parasites and hyperparasites of *Hyponomeuta malinellus*, Zell., from observations made in Serbia during 1925 and 1926. The action of the parasites varied considerably in different localities and in different years. The number of *H. malinellus* destroyed was between 27 and 47 per cent., with an average of 45 per cent. *Discochaeta euonymellae*, Ratz. (*cognata*, Schin.) was the most active parasite, while *Pimpla examinador*, F., *P. maculator*, F.,

and *Agrypon anxium*, Wesm., were rarely found and should be considered accidental. *Pteromalus* (? *variabilis*, Ratz.) and a species of *Chalcis* also occurred. The maximum emergence of the adults of *Herpestomus brunnicornis*, Grav., took place one week after the maximum emergence of adults of *Hyponomeuta malinellus* from unparasitised pupae. The polyembryony of the Chalcid, *Ageniaspis fuscicollis*, Dalm., is well known, and 71-168 adults, always of the same sex, were obtained from each caterpillar of *H. malinellus*. Another member of this genus [*H. euonymellus*, L.] was also attacked by this parasite, 205-257 individuals being reared from each host. *Angitia armillata*, Grav., which also attacks the caterpillars, occurred frequently, but was itself parasitised by *Tetrastichus crassinervis*, Thoms., and *Mesochorus confusus*, Holmgr. *T. crassinervis* attacks the larvae and pupae, an average of 11 adults being obtained from each cocoon. *M. confusus* parasitised an average of 18.7 per cent. of the cocoons, attacking its host while still in the body of *H. malinellus*. *T. crassinervis* also parasitised *M. confusus* and *H. malinellus*. It usually attacks the young pupae of the latter, though also found in the mature pupae and larvae (an average of 27 parasites per pupa was obtained). Larvae of *Sarcophaga affinis*, Fall. (*Agria mamillata*, Pand.) were found living in the nests of *H. malinellus* preying on the pupae. Adults from larvae taken in July emerged in April of the following year.

[SHOROKHOV (S. I.). Шорохов (С. И.). **A New Method of Controlling Granary Pests by means of CS<sub>2</sub>**. [In Russian.]—*Moscow Agric. Sect., Sta. Plant Prot.*, no. 1, 16 pp. Moscow, 1926. [Recd. January 1927.]

In various granaries and storehouses the chief place of shelter for insect pests is the space between the floor and the ground. In these, insects may be effectively controlled by fumigation with carbon bisulphide. The methods of application and the dosage are discussed; these must necessarily vary according to the size and conditions of the space to be treated.

[PRINTZ (Ya. I.). Принц (Я. И.). **Report of the Entomological Department for the Years 1925-1926**. [In Russian.]—*Vitic. Union "Concordia"*, 36 pp. Baku, 1926. [Recd. February 1927.]

*Phylloxera* was first noticed in Azerbaijan in 1924, and has since spread over a considerable area. The reaction of different varieties of vine to infestation is briefly discussed. Field and laboratory observations indicate that there are 6 generations in the year; but the investigations should be continued for several years before definite conclusions are reached. Leaf-galls have not been found. Flooding as a remedial measure could only be applied on one vineyard; the results indicate that the soil conditions are suitable for this method, but its application is limited through lack of water. During the summer of 1926 soil fumigation with carbon bisulphide proved successful, a mixture of about 1 oz. carbon bisulphide and 1 oz. kerosene to the square yard giving complete control in experiments. This method was almost as effective under field conditions, the plants developing new roots a month after treatment. The soil treated was a mixture of clay and sand.

*Polychrosis botrana*, Schiff., was abundant in the spring of 1925, in spite of the severe winter and the activities of predators. Overwintering pupae were found in the reeds, used in this region in place of wooden stakes. As these reeds, placed in the vineyards in the spring, become dry during the summer and crack, they afford a suitable shelter for the pupae. The pest is less numerous where the reeds are absent and the vines are trained along three wires, probably because large numbers of pupae are destroyed by natural enemies and there is a relative scarcity of shade and humidity during the summer. The influence of humidity on the different stages requires further study; a dry summer does not necessarily mean a reduced infestation in the following year. In 1925 successful results were obtained by dusting with Sturn's arsenical preparation, and it was estimated that on an area of 4,000 acres nearly 800,000 gals. of wine were saved. For one application the dust should be applied at the rate of 13 lb. an acre; it should be directed upwards and cover both sides of the bushes. In 1926 the dusting was carried out in most vineyards with equal success; in the few untreated areas the injury amounted to 25-30 per cent. Calcium arsenite may be used as an alternative and may be mixed with a considerable amount of sulphur.

Under the conditions existing in Transcaucasia sprays have proved less effective than dusts. The vines should be trained along three wires with cement supports, thus concentrating all the pupae on the main stems, which should be cleaned periodically and painted with kerosene emulsion or 40 per cent. iron sulphate. Reeds should only be used as supports if they are changed every year or dipped in kerosene for a few minutes. In winter pruning the shoots should be cut to within 1 cm. of the nodes, when many larvae will pupate in the small decaying stumps and can be destroyed.

In 1925 large numbers of *Pseudococcus citri*, Risso, were destroyed by severe frosts, but in 1926 it was very numerous, mainly owing to the absence of parasites. In both years the mealybugs only migrated from the stems to the green parts in July. When the infestation is very heavy an emulsion of kerosene, lime and tobacco is not effective, and complete destruction can only be obtained by fumigation.

In spite of the type of soil (clay and sand mixed) *Polyphylla olivieri*, Lap., occurs in large numbers, probably owing to the abundance of manure. The life-cycle occupies 3 years. A mass flight of the beetles occurred in 1926, during which season 300,000 adults were collected as against 180,000 in 1925. During the first year the larvae feed entirely on humus, but attack the roots of vines in the second year. Considerable time has been devoted to the study of the movement of the larvae in the soil, particularly with reference to temperature and humidity conditions. They are within a spade's depth of the surface at a temperature of 15° C. [59° F.], and it is only then that turning the soil over and collecting the larvae is effective. This method is of great value when laying out new plantations, provided that these cover a fairly large area, so that they are little affected by adults or larvae coming from outside. Carbon bisulphide gave good results in 1926, but the cost is prohibitive.

*Tetranychus telarius*, L. (*Epitetranychus althaeae*, von Hanst) has been believed to occur on vines in the Caucasus, but during 1925 it was ascertained that though this mite occurs in the vineyards on various weeds, it is not present on the vines. The mite attacking vines is apparently a different species. It hibernates under loose bark or in the

cracks of the living bark and remains on the stems until the leaves appear, when it migrates to them. As in the case of *T. telarius*, the development depends on atmospheric humidity. From 1923 to 1925 the summers were very dry and the mite occurred in great abundance, but as a result of rain in May, June and July of 1926 it was almost absent, appearing again with the drier weather in August. As the mite hibernates on the plants, painting the stems with 40 per cent. iron sulphate in March gave good results, and successful experiments were also made with soap solution.

The Jassid, *Zygina parvula*, Boh., appeared among the vines in 1923 and was abundant throughout the vineyards in 1925 and 1926. As a result of the injury the sugar content of the grapes was reduced by 3 per cent. The eggs are laid on the lower surface of the leaves under the epidermis. The Jassids feed on the leaves, which turn yellow, wither and fall. Before the appearance of vine leaves they occur on various weeds. There are 4 generations in the year. In October or the beginning of November the Jassids begin to hibernate under the fallen leaves. This pest is apparently recorded for the first time as occurring on grapes. One egg parasite has been observed. Soap solution is an effective spray, but as at least 300 gals. an acre are necessary for control, the method is too expensive.

Insects of minor importance on vines are *Byctiscus betulae*, L. (*Rhynchites betuleti*, L.), a Noctuid [*Euxoa segetum*, Schiff.], *Synoxylon* sp., and *Rhizoglyphus* sp.

JACKSON (F. K.). [**Locust Campaign.**—*Mthly. Agric. Bull., Iraq*, 16th Nov.—15th Dec., 1926, 1 p. Baghdad, December 1926.

Samples of egg-cases dug from areas in Iraq invaded by locusts in 1926 show that 5–38 per cent. are attacked by the larvae of the Clerid, *Trichodes laminatus*, Chevr.

DASTUR (J. F.). **A Mosaic-like Disease of Sugarcane in the Central Provinces in 1926.**—*Agric. Jl. India*, xxi, pt. 6, pp. 429–432, 6 refs. Calcutta, November 1926.

It is considered that a disease of sugar-cane described from the Central Provinces is the same as that described as streak disease from South Africa [*R.A.E.*, A, xiii, 393]. It occurs in several varieties of cane, but some appear to be immune. No definite organism responsible for the condition has yet been isolated.

RAMACHANDRA RAO (Y.). **Control of the Coconut Caterpillar (*Nephantis serinopa*) by its Parasites.**—*Agric. Jl. India*, xxi, pt. 6, pp. 452–459, 1 pl., 6 figs. Calcutta, November 1926.

At Mangalore [*R.A.E.*, A, xiv, 480] the life-cycle of *Nephantis serinopa*, Meyr., is somewhat shorter than in Ceylon [*R.A.E.*, A, x, 539]. Its natural enemies occurring at Mangalore are the Chalcid, *Stomatoceras sulcatiscutellum*, Gir., breeding in the pupae, and the Carabid, *Callida splendidula*, F., feeding on the larvae. The Chalcid also occurs in the plains of South India, where it is itself parasitised by a Eurytomid. Other parasites occurring in South India are a Bethyloid, *Perisierola* sp., attacking the pupae, and a Braconid, *Apanteles* sp., and an Elasmid, *Elasmus nephantidis*, Rohw., attacking the larvae. The

habits of all these parasites and the method of attacking the host are briefly described. The parasites recorded from the State of Cochin are *S. sulcatiscutellum*, *E. nephantidis*, *Perisierola* sp., *Microbracon* sp., a Tachinid and a Eulophid. The Eulophid, which lays numerous eggs in the pupa of the host, was found to be the most efficient, and wherever it predominated *N. serinopa* was not at all noticeable. This parasite is being introduced into Mangalore and the neighbourhood of Coimbatore.

GATER (B. A. R.). **Further Observations on the Malaysian Coconut Zygaenid** (*Artona catoxantha*, Hamps.) [and its Parasites].—*Malayan Agric. Jl.*, xiv, no. 10, pp. 304-350, 1 pl., 33 figs., 4 refs. Kuala Lumpur, October 1926. [Recd. January 1927.]

Since the previous account of the Zygaenid, *Artona catoxantha*, Hamps., on coconuts in Malaya was published [*R.A.E.*, A, xiii, 359], there have been three outbreaks during which further data have been collected, particularly from one starting in June 1925 and ending in October after heavy rainstorms. The earliest infestation occurred near a large incinerator, thus supporting the theory that fires under the palms encourage outbreaks, and it was again noticed that rain accompanied by wind was the terminating factor. The caterpillars were observed to feed on banana, but this food-plant is probably only attacked when the normal one is scarce. The moths could not be induced to oviposit in captivity, but the life-history from egg to adult was worked out for the first time without a break, as it was found possible to rear the larvae right through from the egg stage on leaves kept fresh by a dilute solution of sulphur dioxide. A pre-pupal period of 1-3 days occurs after completion of the cocoon, and the life-cycle is on the whole a little shorter than was previously thought. The stages are described at greater length than before. Eggs hatched in the laboratory at temperatures between 88° and 68° F; at 89° F. only 1 in a batch of 12 hatched; from 64.5° F. there was a gradual decrease, and none hatched after remaining at 55.4° F. for a week. The proportion of sexes seems to be equal, but in the laboratory rather more males than females reached maturity.

No egg parasites were observed. The most important parasite of the larvae is the Tachinid, *Ptychomyia remota*, Ald., which has been successfully introduced into Fiji as a control of the Zygaenid, *Levuana iridescens*, B.-B. [*R.A.E.*, A, xiv, 431]. The history of this introduction is outlined, and the stages of the insect are described. Much of the life-history has previously been noticed [*R.A.E.*, A, xiii, 359]. If larvae of the normal host are not present, almost any species is used by *P. remota* for oviposition, even dead flies being utilised, although eggs so laid fail to hatch. *A. catoxantha* has, however, been the exclusive host in Malaya except experimentally. In captivity when caterpillars of the 5th instar are parasitised only a few days before they are due to pupate, the larval period is accelerated, the time from oviposition to emergence of the larva for pupation being reduced to 4 days; in all such cases a dwarfed adult is produced. The larva generally emerges for pupation from 1 to 4 days after the host completes the spinning of its cocoon and pupates on the same day. It was difficult to keep the adult parasites alive for any length of time in the laboratory, but when fed on diluted honey they survived for an average of 13 days, with a maximum of 30. The degree of parasitism of *A. catoxantha* by *P.*

*remota* reached on an average about 37 per cent. during the present study, and would have been higher but for the presence of natural enemies, which include the predacious Clerid, *Callimerus arcifer*, Chpn., and a fungus disease that attacks the pupae of the fly. By far the most important enemy, however, is a Chalcid, *Melittobia* sp. Superparasitism of *A. catoxantha* by *P. remota* occurs to a remarkable extent, as many as 72 eggs being found on one caterpillar. Many eggs may hatch in one host, but in only one case has more than one larva been known to reach maturity. It is considered on the whole to be a fairly efficient parasite in its own habitat and will probably be colonised in the Islands of the Malay Archipelago, where *A. catoxantha* has been accidentally introduced. For experiments on the resistance of pupae of *P. remota* to low temperatures a special apparatus, which is described, was devised. It was found that it would be possible to delay emergence of *P. remota* sufficiently long for the pupae to be transported over considerable distances. They were kept dormant for over 30 days at 57.2° F.

The activities of *Melittobia* severely limit the powers of *P. remota*, and as the parasites emerge at any temperatures between 66.2° and 91.4° F., and are capable of withstanding still lower temperatures, the danger of importing them with *P. remota* through transmission in cold storage is a very real one. The stages of the Chalcid are described.

In 1925 males were found, thus refuting the theory that the females are exclusively parthenogenetic. Eggs are laid in batches of about 20 in the puparium of the host; the maximum progeny obtained from one female was 375. The larvae hatch in 2 or 3 days and live for 6 days before pupating; the pupal period lasts 7 or 8 days, totalling 15 to 17 days for the full life-cycle, though this has been found to vary from 12 to 30 days. The females emerge through small, round exit holes in the puparium and pass in and out for a while, being fertilised during this time by the males, which remain always within the host puparium and die shortly afterwards. In the field, the average number of adults emerging from a single puparium is 28. The mean figure throughout the breeding work shows a proportion of one male to nine females. Apparently, pupae of *P. remota* less than 3 days old are unsuitable for the parasite, which, however, can complete its life-cycle on pupae that would normally produce adults in another day or two. Females in the laboratory lived and continued oviposition for an average of 25 days. The females on the coconut leaves are fairly active, but do not readily take wing, their flights being of short duration. Another Chalcid, which may be only another form of the above, or may be a tertiary parasite, has been observed; this may account for the fact that although the Chalcid parasite of *P. remota* has very good reproductive powers and prevents numbers of the pupae from reaching maturity, it never overwhelms its host as it would be expected to do, in view of the fact that the average reproductive power of a single female in breeding experiments was 150. There are in addition two Proctotrupid and a number of other Chalcidoid parasites of *P. remota*. The average extent of parasitism by these hyperparasites reached 60 per cent., so that with these and the other enemies the mortality of *P. remota* on two occasions reached 100 per cent.

Another important parasite of *A. catoxantha* is a Braconid (possibly a species of *Apanteles*), which is probably a much more powerful controlling agent in ordinary times than is apparent during outbreaks. Moreover, it attacks the younger instars, while *P. remota* attacks the later ones, so that an excellent sequence in parasitism is provided. The

larva remains within the host for about 10 days and spins its cocoon on the day of emergence, the host being still capable of movement but dying a few hours later; the pupal period lasts 4 or 5 days. About 12 per cent. of the last stage larvae and pupae were attacked by five species of Chalcidoid hyperparasites.

The Tachinid, *Degeeria albiceps*, Macq., was obtained in small numbers from *A. catoxantha*. It is apparently the dominant parasite of this host in Java. The life-history has not been worked out in detail, but it is rather longer than that of *P. remota*. Previously unrecorded parasites include an Ichneumonid, possibly a species of *Mesostenus*, which is an ectoparasite of the pupa, and is probably also present in Java; an unidentified Chalcid which is probably an ectoparasite, and two Proctotrupids. An almost daily record of parasitism during August–November was kept and indicates approximate percentages of 48 for *P. remota*, 5 for the Braconid, and 1 for all other parasites.

An attempt is made to show by means of a diagram the inter-relations and relative importance of the parasites and hyperparasites of *A. catoxantha*. These are somewhat involved. For example, a Chalcid has been found as a parasite of *A. catoxantha* and also as a hyperparasite attacking both *P. remota* and the Braconid. Another is more often found as a parasite of *P. remota* than of *A. catoxantha*. If only young larvae of *A. catoxantha* are available for *P. remota*, the fly will attack these and they will be wiped out; generally, however, there is not enough nourishment in these young larvae for the parasite to complete development, and both die. Again, there is often a lapse between maturation of the caterpillars of early and late-laid eggs, and in this case the fly will oviposit on the caterpillars that first attain sufficient size for development of the maggot. Should the fly lay all its eggs on these caterpillars, the later ones will escape. Under normal conditions, *P. remota* will also take varying times to reach maturity, since its rate of development is dependent on its host; it is often found, however, that there is a gap in the sequence of emergence of *P. remota*, which is caused by the activities of hyperparasites, and hence there will be a gap in parasitised larvae of *A. catoxantha* in the succeeding generation.

The Clerid predator of *A. catoxantha* has now been identified as *Callimerus arcifer*, Chpn. Breeding in captivity was not successful, so that no idea could be formed of the number of larvae killed by it; it was also found to attack *P. remota*, and several larvae collected in the field were reared entirely on pupae of the latter insect. The pupal period of this Clerid was found to occupy 7 or 8 days, the adult remaining in the cocoon for 3 or 4 days after eclosion. The larval and pupal stages are described. In British North Borneo, a Pentatomid, provisionally identified as *Cantheconidea furcellata*, Wolff, is reported as feeding on adults of *A. catoxantha*. This species generally attacks Lepidopterous larvae and has not apparently been recorded previously as attacking an active moth.

ROHWER (S. A.). U.S. Bur. Ent. **Description of a new Braconid Parasite of *Artona catoxantha* (Hymenoptera).**—*Proc. Ent. Soc. Wash.*, xxviii, no. 8, pp. 188–189. Washington, D.C., November 1926.

*Apanteles artonae*, sp. n., an important parasite of the early instars of *Artona catoxantha*, Hamps., in the Federated Malay States, is described. Efforts are being made to introduce it into Fiji to control *Levuana iridescens*, B.-B.

CORBETT (G. H.) & GATER (B. A. R.). **A Preliminary List of Food-plants of some Malayan Insects.**—*F.M.S. & S.S. Dept. Agric.*, Bull. 38, xvii + 95 pp., 32 refs. Kuala Lumpur, 1926.

This list, which includes only the insects dealt with during the last 5 years, is in three parts. The first enumerates the insects, under their orders and families, with the food-plants on which they have been found. The second gives a list of plants under their natural orders, showing the insects recorded on them and the part of the plant attacked. The third consists of a list of insects attacking stored products, etc., that cannot be included in the plant list, and an index covering the orders, genera and popular names of plants mentioned in the lists. A short introduction discusses the position and climate of the Malay Peninsula, and gives very brief notes dealing with the more serious pests in each family. A number of references to published information on some of the insects is given.

MIYOSHI (K.). **List of Injurious Insects of *Citrus* from Japan.** [*In Japanese.*]—*Insect World*, xxx, nos. 9 & 10, pp. 303–308 & 338–343. Gifu, 15th September & 15th October 1926.

This list comprises 194 species of insects and 3 mites.

**Law and Regulations concerning the Plant Quarantine Service in Japan.**—31 pp. Yokohama, Imp. Plant Quar. Serv., October 1926.

This is a reprint of the Plant Quarantine Law of 25th March 1914, dealing with the import and export of plants and plant products, and of the regulations and ordinances subsequently issued in connection with it.

**Outline of the Plant Quarantine Service of Japan.**—18 pp., 1 map. Yokohama, Imp. Plant Quar. Serv., October 1926.

The organisation and activities of the Plant Quarantine Service in Japan and the regulations concerning the import and export of plants are described, with details of the sea-ports where plant inspection is carried out. Pests introduced into Japan include *Phylloxera vastatrix*, *Eriosoma lanigerum*, *Icerya purchasi*, *Ceroplastes rubens* and *Lepidosaphes ulmi*.

A list is given of the more important pests that have been intercepted on imported plants since the inception of the system of plant quarantine at the end of 1914.

The principal pests found on plants intended for export from Japan were *Megastigmus cryptomeriae*, in seeds of *Cryptomeria*, *M. aculeatus* in rose seeds, *Balaninus camelliae* in chestnuts, *Diaspis pentagona* on peach and plum, *Aspidiotus perniciosus* on pear and apple, *Parlatoria proteus* on pear, *Icerya purchasi* and *Prontaspis yanonensis* on *Citrus*, *Ceroplastes rubens* on *Citrus* and persimmon, *Oberea japonica* and *Chreonoma fortunei* on apple, *Aegeria hector* and *Heterodera radicolica* on cherry, *Phylloxera vastatrix* on grape vines, and *Rhizoglyphus echinopus* in lily bulbs.

**Quarantine Proclamation, no. 164.**—*Commonw. Australia Gaz.*, no. 118, 1 p. Melbourne, 2nd December 1926.

With a view to preventing its introduction into Australia, *Popillia japonica*, Newm., is declared a pest under the Quarantine Act.

MUNGOMERY (R. W.). **The Soldier Fly and its Association with Cane.**—*Queensland Agric. Jl.*, xxvi, pt. 5, pp. 376-377. Brisbane, 1st November 1926.

As a result of further investigation of the damage to sugar-cane caused by the Stratiomyiid, *Metoponia rubriceps*, Macq. [*R.A.E.*, A, xiv, 576], in a district where it is common, the author found that the larvae were causing some injury at the end of September to cane sets in sandy soil planted 6-8 weeks previously, although the damage would probably have been negligible if dry weather had not prevailed after planting. He considers that the economic importance of this fly has been considerably over-estimated by growers, who have attributed to it damage due to other causes. It has been found at the roots of blady grass [*Imperata arundinacea*], *Paspalum* and other native grasses, and there is no doubt that it originally attacked these grasses, so that all cultivated land should be kept free from grass; periodical burning of blady grass when the flies are emerging would probably destroy many, as they are sluggish, especially the females.

JARVIS (E.). **Entomological Hints to Canegrowers.**—*Queensland Agric. Jl.*, xxvi, pt. 5, pp. 378-379. Brisbane, 1st November 1926.

A somewhat severe infestation by *Cirphis unipuncta*, Haw. (army worm) occurred on sugar-cane in one district in October, but it was controlled by spraying several rows of cane with lead arsenate to check the advance of the larvae [*cf. R.A.E.*, A, xiv, 331]. Injury to the leaves of young cane by larvae of the butterfly, *Melanitis leda*, L., was observed in one locality.

VEITCH (R.). **An Important Queensland Insect Pest.**—*Queensland Agric. Jl.*, xxvi, pt. 5, pp. 385-386, 2 figs. Brisbane, 1st November 1926.

A Lygaeid, *Nysius* sp., has recently caused serious damage in Queensland, attacking potato, tomato, peach, cherry, mango, grape and cotton, and probably many other plants. Nicotine sulphate and kerosene emulsion sprays do not control the pest satisfactorily, and further experiments are necessary. Mechanical measures appear to be the most promising, and it is suggested that in orchards the bugs should be shaken from the trees in the early morning into sheets of canvas, or shallow pans made of galvanised iron, containing a mixture of 1 pt. kerosene in 1 gal. water [*R.A.E.*, A, iv, 311], while, where field crops are affected, they should be shaken into containers drawn between the rows.

BENSON (A. H.). **Tomato Culture.**—*Queensland Agric. Jl.*, xxvi, pt. 5, pp. 387-395. Brisbane, 1st November 1926.

*Heliothis (Chloridea) obsoleta*, F., is an important pest of tomatoes in Queensland; the best means of controlling it is spraying the plants and fruit with 4-5 lb. lead arsenate in 100 gals. water, at intervals of

about 10 days from the time that the fruit is first formed, until it is full-grown. Where fungus diseases also occur, lead arsenate may be used in combination with Bordeaux or Burgundy mixtures, either as a spray or as a dust. Young tomato plants are often destroyed by cut-worms, which also attack the foliage of older plants; a bait consisting of 50 lb. bran, 2 lb. Paris green, 2 qts. molasses, 3 oranges and about 4 gals. water, broadcast on the ground at evening, is recommended for controlling them. The roots of tomatoes are sometimes seriously injured by Nematodes; on land infested with this pest a crop that is not susceptible to attack should be planted, and tomatoes should never follow tomatoes or potatoes.

COPELLO (A.). **El moscardon cazador de abejas.** [The Fly preying on Bees.]—*Rev. Apicultura*, ii, no. 22, pp. 6-9, 1 fig. Buenos Aires, December 1925. [Recd. January 1927.]

Bees in Argentina are preyed upon by an Asilid, *Mallophora ruficauda*, Wied. The eggs of this fly are laid in batches on posts and other supports situated in cultivated land. The larvae burrow in the ground and feed on the larvae of a Dynastid beetle, *Phileurus vervex*, Burm. *M. ruficauda* appears to be a serious enemy of hive-bees. The measures advised are the capture of the adult flies and the destruction of the egg-masses.

DA ROCHA (J. B.). **Ligeiras notas sobre a industria do bisulphureto de carbono no Brasil e do seu emprego na luta contra o *Stephanoderes hampei* (Ferr.).** [Short Notes on the Carbon Bisulphide Industry in Brazil and on the Use of this Chemical against *S. hampei*.]—*Comm. Estudo e Debellação da Praga Cafêeira*, Pub. no. 18, 37 pp., 6 pls. S. Paulo, 1926. [With a Summary in English.]

An account is given of the manufacture of carbon bisulphide in Brazil, where the factories now produce 14-16 tons daily. It is largely used as a fumigant against various insects and is now employed for treating bagged coffee against the coffee-berry borer, *Stephanoderes hampei*, Ferr. [*R.A.E.*, A, xiv, 178]. The Berry-borer Commission do not accept an impure product, such as one containing more than 0.001 gm. per cent. of sulphuretted hydrogen, as this imparts an unpleasant flavour to the roasted coffee. Carbon bisulphide leaving residues by evaporation is unsuitable as there is difficulty in removing them from the fumigation chambers; a product containing water is also unsuitable as the evaporation of the fumigant is hindered.

As regards the action of carbon bisulphide on *S. hampei* it was found that the beetles sometimes remain apparently dead for days and then revive and breed. This is thought to be due to the coffee not being fully ripe and therefore absorbing the gas with difficulty. The fibres of the material of which the coffee bags are made do not suffer from exposure to the fumigant.

MOREIRA (C.). **Combatendo os insectos inimigos.** [Work against injurious Insects.]—*Chacaras e Quintaes*, xxxiv, no. 6, pp. 541-542. S. Paulo, 15th December 1926.

A spray of 1 lb. Paris green, 2½ lb. quicklime, 10 lb. wheat flour or molasses, and 100 gals. water is recommended against the larvae of *Alabama argillacea* attacking young maize in the State of Santa Catharina, Brazil.

DE CAMPOS NOVAES (J.). **Um bezouro das sementes do milho e cereaes, o *Agriotes ustulatus* ou o verme de arame, dos alemães.** [A Beetle attacking Maize and Cereal Seedlings, *A. ustulatus*.]—*Chacaras e Quintaes*, xxxiv, no. 6, pp. 545-546, 1 fig. S. Paulo, 15th December 1926.

In Brazil the cotyledons of recently sown maize are injured by a wire-worm, apparently *Agriotes ustulatus*, Schall., though its identity is doubtful. The presence of this pest does not appear to have been noticed before in Brazil.

CURRAN (C. H.). **Recommendations and Directions for the Control of Stored Product Insects under Indoor Conditions.**—*Scientif. Agric.*, vii, no. 5, pp. 166-169. Ottawa, Ont., January 1927.

The methods of controlling insect pests of stored products in mills, warehouses, etc., are briefly reviewed. These include superheating, freezing and fumigation. For fumigation with hydrocyanic acid gas, 72 oz. sulphuric acid and 96 oz. water to 4 lb. sodium cyanide, using a 4-gallon earthenware crock, is sufficient for 6,400 cu. ft. of space. If calcium cyanide is used, 2½ to 3 lb. of coarse grade dust to 1,000 cu. ft. of air space should be used. Carbon bisulphide can be used at the rate of from 2 to 8 lb. to 1,000 cu. ft. of air space; carbon tetrachloride is safer, as it is not inflammable, but requires over twice the quantity and costs at least twice as much by weight.

KAMAL (M.). **Four New Species of Parasites from Aphidophagous Syrphidae (Hymenoptera).**—*Canad. Ent.*, lviii, no. 11, pp. 283-286. Orillia, Ont., November 1926.

These new species are all described from California; they are *Bothriothorax faridi* reared from *Syrphus opinator*, O.S.; *Syrphophagus smithi* reared from *S. opinator* and *S. nitens*, Zett.; and *Conostigmus zaglioui* and *C. timberlakei* reared from unidentified Syrphid puparia.

MOTE (D. C.). **Insect Pests of Truck and Garden Crops.**—*Oregon Agric. Expt. Sta.*, Circ. 65, 40 pp., 27 figs., 1 ref. Corvallis, Oregon, January 1926. [Recd. January 1927.]

The pests dealt with are arranged under the crops attacked, with a short account of their seasonal development and life-history in Oregon, and of remedial measures. The general control of insect pests by agricultural measures is discussed, and the preparation and application of a number of insecticides are described.

THOMPSON (B. G.). **Cutworm Control in Oregon.**—*Oregon Agric. Expt. Sta.*, Circ. 70, 6 pp., 4 figs. Corvallis, Oregon, March 1926. [Recd. January 1927.]

There are over fifty species of cutworms in Oregon, of which the most important are *Lycophotia margaritosa*, Haw. (variegated cutworm), *Neuria procincta*, Grote (olive green cutworm), and *Agrotis ypsilon*, Rott. (greasy cutworm). The bionomics vary with the species, but a typical life-history is given. A poison bait of 25 lb. coarse wheat bran, ½ lb. salt, and 1 lb. white arsenic or Paris green, mixed thoroughly

with 1 U.S. pt. syrup or brown sugar and enough water added to make a crumbly mash, gives satisfactory control. An equally effective bait can be made by dissolving 1 lb. sodium fluoride in about 2 U.S. gals. water, stirring in 2 U.S. qts. molasses and adding 16 lb. coarse wheat bran. These baits should be scattered over the infested area at the rate of 12-15 lb. per acre. They act as a preventive measure if scattered over gardens before early planting, or if placed round plants that have been newly set out. Poultry and other livestock should not be allowed in a treated field.

ROCKWOOD (L. P.). **The Hessian Fly in Oregon.**—*Oregon Agric. Expt. Sta.*, Circ. 77, 7 pp., 4 figs. Corvallis, Oregon, August 1926. [Recd. January 1927.]

Owing to the late sowing of winter wheat in 1925 and to the warm weather in the spring of 1926 causing the early emergence of the first and second broods of the Hessian fly [*Mayetiola destructor*, Say], much damage was done to both winter and spring sown wheat. It is considered that winter wheat should be sown as soon as possible after the "fly free" date. Barley and rye are seldom seriously injured by this fly, and oats are not attacked.

The various stages of the insect are described, and its bionomics in Oregon are given. The nature of the injury and various cultural methods of control are discussed.

FRACKER (S. B.). **Encouraging and Discouraging Features of the European Corn Borer.**—*Wisconsin Horticulture*, xvii, no. 4, pp. 50-52. Madison, Wis., December 1926.

This is a general account of the present position as regards the European corn borer [*Pyrausta nubilalis*, Hb.] in the United States and Canada and of the measures in force to prevent its introduction into Wisconsin. Though the necessity and importance of protecting Wisconsin from such a serious pest is fully realised, it is believed that the accepted methods of placing maize stalks in silos or using them as winter food for stock would greatly reduce the seriousness of an infestation.

DRAKE (C. J.). **The European Corn Borer.**—*Iowa Agric. Expt. Sta.*, Circ. 100, 16 pp., 13 figs. Ames, Iowa, March 1926. [Recd. January 1927.]

In view of the fact that *Pyrausta nubilalis*, Hb. (European corn borer) is advancing rapidly westward towards Iowa, information is given on its distribution in the United States, its economic food-plants, and its bionomics, control and natural enemies. Notes are given on other maize-boring larvae with which it may be confused.

MUSSELMAN (H. H.). **Machinery and Corn Borer Control.**—*Michigan Agric. Expt. Sta. Qtrly. Bull.*, ix, no. 2, pp. 35-36. East Lansing, Mich., November 1926.

Recent improvements in farm machinery intended for the destruction of the larvae of the European corn borer [*Pyrausta nubilalis*, Hb.] are briefly described. By the attachment of a special device to the corn

binders the stalks may be cut at 2 inches or less from the ground. Where such low cutting attachments are not practicable, a stubble beating machine may be used; the stubble is torn to shreds to the level of the ground by rapidly revolving knives.

McDANIEL (E.). **The Larger Narcissus Bulb-fly.**—*Michigan Agric. Expt. Sta. Qtrly. Bull.*, ix, no. 2, pp. 54-55. East Lansing, Mich., November 1926.

*Merodon equestris*, F. (larger narcissus bulb fly) is recorded for the first time in bulbs in Michigan. The life-history is briefly described, the remedial measures recommended being vacuum fumigation with carbon bisulphide or treatment with hot water [*R.A.E.*, A, xiv, 492].

WEIGEL (C. A.) & MIDDLETON (W.). **Insect Enemies of the Flower Garden.**—*U.S. Dept. Agric.*, Farmers' Bull. 1495, 54 pp., 90 figs. Washington, D.C., August 1926. [Recd. January 1927.]

This bulletin gives a brief account of the bionomics and control of over 100 insect pests of flowers and ornamental plants. The preparation of various insecticides and apparatus for their application are also described.

TOWNSEND (M. T.). **The Breaking-up of Hibernation in the Codling Moth Larva.**—*Ann. Ent. Soc. Amer.*, xix, no. 4, pp. 429-439, 9 refs. Columbus, Ohio, December 1926.

Experiments were undertaken with a view to determining what factor or factors bring about the breaking up of dormancy in larvae of the codling moth [*Cydia pomonella*, L.] in spring. Second generation larvae were collected from beneath tar paper bands tacked around tree trunks in the autumn, removed from their cocoons and placed in small cardboard boxes. They showed a strong tendency to enter the small glass tubes (1 in. by  $\frac{1}{4}$  in. diameter) that had been placed upright in the bottom of the box, and spin cocoons. These tubes were later removed from the boxes and stored at low temperatures. It has been found by various workers that hibernation in cold-blooded animals is often marked by a reduction of the water content of the organism and that the addition of water tends to break up dormancy. The author found that soaking the hibernating larvae for 2 hours a week caused them, when placed in a temperature of 30° C. [86° F.], to pupate sooner than those that were not soaked, and that the greatest percentage of pupation took place among larvae soaked the greatest number of times. It was also found that soakings at 10° C. [50° F.] shortened the time before pupation more than soakings at 86° F., while soakings at 86° F. shortened the length of time from pupation to emergence. The breaking up of dormancy in the codling moth larva is marked by the metamorphosis of the insect, a process which consists of the autolysis of the larval tissues followed by the growth and development of adult organs. It seems probable that the autolysis is due to the action of acids or enzymes and that in either case the reaction would be accelerated by the addition of water. Experiments showed that although larvae stored at low temperatures (0° C. [32° F.] or 50° F.) for considerable periods do not pupate they undergo some sort of preparation for pupation, so that when they are placed at a higher temperature (86° F.) later in the season the

pupal period is shorter than if they have been stored for a few days at 22° C. [71.6° F.]. On the other hand, it was found that larvae stored for some time at 71.6° F. lost their power to pupate; thus it would seem that low temperatures are necessary for this preparation for pupation, which takes place slowly at 32° F., reaches its maximum activity at about 50° F., and does not go on at all at temperatures above 71.6° F. Furthermore, exposure to 50° F., if continued long enough, may prove detrimental. It seems likely that if the process of autolysis in codling moth larvae were due to acidity, the process would be accelerated at higher temperatures, whereas in fact no reaction took place at temperatures above 71.6° F. Thus it may be supposed that this process is caused by an enzyme having a maximum activity at temperatures around 50° F., and experiments showed that the greatest percentage of pupation and the fastest preparation took place among larvae stored at 50° F. and soaked repeatedly. The cold soaking rains of winter and spring would furnish ideal conditions for preparing the insects for renewed activity as soon as the warm weather comes.

The summer brood larvae of the codling moth pupate at higher temperatures when the enzyme suggested above would not be able to work, and in this case the process may be due to acidity.

KRAFKA (J.) & MILLER (J. E.). **Notes on a New Fungus of the Boll Weevil.**—*Ann. Ent. Soc. Amer.*, xix, no. 4, p. 464, 1 fig. Columbus, Ohio, December 1926.

Resting sporangia of a fungus (*Pseudolpidium* sp.?) of the family Chytridiales were found in the alimentary tract of a dead boll weevil [*Anthonomus grandis*, Boh.].

BALDUF (W. V.). **The Bionomics of *Dinocampus coccinellae*, Schrank.**—*Ann. Ent. Soc. Amer.*, xix, no. 4, pp. 465–498, 21 refs. Columbus, Ohio, December 1926.

The synonymy of *Dinocampus coccinellae*, Schr., a Braconid parasite of Coccinellids, is discussed [*R.A.E.*, A, xi, 117]. It has been recorded from New Zealand, Europe, North America and Hawaii. A list of its known hosts is given, with the addition of *Coccinella sanguinea*, L., *Hippodamia parenthesis*, Say, and *Adalia bipunctata*, L.; phytophagous Coccinellids do not seem to be attacked.

A long and detailed account of its bionomics is given from observations in Illinois. The method of attacking the host and the structure of the ovipositor are described. The parasite shows a great deal of activity in inducing the host to raise its elytra, thus permitting oviposition. If, as is generally believed, the adult lives two weeks or more in nature, it is probable that a single female is potentially able to lay from 200–400 eggs. Under natural conditions three larvae were rarely found in one host, two were found in about 2 per cent. of the Coccinellids dissected, while the majority contained only one, indicating that usually not more than one egg is deposited in a single attack. At this rate a single parasite would be able to parasitise several hundred Coccinellids, but it is improbable that it can find that number of beetles in its lifetime or that its vitality is sufficient to support the infestation of such a large number in view of the activity needed for oviposition. The various stages of the parasite are described. Under laboratory conditions where the average temperature was between 70° and 75° F.

the eggs hatched in 6-7 days. If more than one egg is deposited in a single host, only one larva survives. After 15-20 days the larva emerges from the back of its host beneath the elytra and begins immediately to spin its cocoon, only relinquishing its hold on the host when the network of silk is strong enough to prevent it falling off the host's support. The beetle usually dies within a week of the emergence of the parasite. The cocoon is spun between the host's legs, which are generally incidentally enmeshed; its formation is described in detail. The pupal stage lasts for 8-10 days. Under laboratory conditions the adults lived only 4-5 days, probably owing to their intense activity when given access to the Coccinellids, their close confinement in daylight and consequent efforts to escape, and the low moisture content of the laboratory, but they have been known to live 20 days in confinement. The insect reproduces parthenogenetically, and no males have been observed. The winter is spent in the first larval instar, or possibly in the egg stage in a few cases, in the body of the hibernating Coccinellid. Since the life-cycle is passed in about four weeks it is possible that 4 or 5 generations occur in the year; feeding is not absolutely prerequisite to oviposition, so that there is no delay in reproduction. The annual rate of parasitism in 1925 was about 15 per cent. for all species from which the parasite has been taken; the conditions affecting the varying rate of parasitism are discussed. Factors that may operate in the selection of the host are enumerated.

Five individuals of *Dibrachys boucheanus*, Ratz., were bred from each of two cocoons of the parasite, from which host it has not previously been recorded.

SANBORN (C. E.). **Boll Weevil in Oklahoma, especially during the Years 1921 to 1925.**—*Oklahoma Agric. Expt. Sta.*, Bull. 157, 32 pp., 10 pls., 4 figs. Stillwater, Okla., February 1926. [Recd. January 1927.]

A good deal of the information on *Anthonomus grandis*, Boh. (cotton boll weevil) contained in this bulletin was given in a circular previously noticed [*R.A.E.*, A, xii, 31]. Later tests have proved that dusting with calcium arsenate is not a satisfactory method of control in Oklahoma. The profit accruing from the use of various methods has been worked out and is shown in tabular form; the materials tested included molasses arsenate, nicotine sulphate and calcium arsenate, Hill's mixture and poisoning by the Florida method [*R.A.E.*, A, xi, 73; xii, 209]. For Oklahoma conditions, the best is the molasses arsenate, consisting of 1 U.S. gal. of good table brand of syrup, 1 U.S. gal. water and 1 lb. calcium arsenate, thoroughly mixed and used fresh, and splashed on to the plants with a mop. About 1 U.S. gallon of this mixture to the acre was used at each application, the treatments being given at intervals of about 7 to 10 days, beginning after infestation reached 10 to 15 per cent.

General recommendations are to ensure correct time of planting, using an early maturing variety of cotton, and to retain a continuous soil mulch until the bolls begin to open. In cases of severe infestation over a large area, the whole community should practise early gathering of the infested squares. Punctured squares should be gathered for 6 weeks after the first ones appear and placed in a parasite cage. Final picking of cotton should be completed as early in autumn as possible,

and all plants should be destroyed immediately afterwards and the fields thoroughly cleaned up. After ginning is completed, all gins should be removed and enclosures prepared for seed and hulls, so that hibernating weevils can only escape into screen traps. Cotton fields and seed beds should be prepared in advance, and made compact, moist and warm, to ensure uniform germination and quick growth. Only as much cotton should be grown as can be thoroughly cared for.

HUNTER (W. D.). **The Pink Bollworm with Special Reference to Steps taken by the Department of Agriculture to prevent its Establishment in the United States.**—*U.S. Dept. Agric.*, Dept. Bull. 1397, 30 pp., 11 figs., 21 refs. Washington, D.C., June 1926. [Recd. January 1927.]

This is a revised edition of a bulletin on *Platyedra* (*Pectinophora*) *gossypiella*, Saund., already noticed [*R.A.E.*, A, vi, 543], with additional information bringing the survey of the situation up to date.

**Entomology.**—*Ann. Rept. Iowa Agric. Expt. Sta.*, 1924-25, pp. 43-46. Ames, Iowa, [1926]. [Recd. January 1927.]

Campaigns against the Hessian fly [*Mayetiola destructor*, Say] have reduced the estimated losses from £300,000 in 1922 to less than £10,000 in 1924. *Meromyza americana*, Fitch (wheat stem maggot) is common in most areas where winter wheat is grown. Severe outbreaks of cutworms and army worms occurred during the summer of 1924. The migrating larvae were headed off by deep furrows with their steep side next the crop; poison bait was then scattered in these furrows and over the fields where the larvae were feeding. Tests of poisons as substitutes for Paris green showed that 1 lb. sodium fluoride or  $\frac{1}{2}$  lb. dry sodium arsenite to 25 lb. bran gave equally good results. Fowls were fed on bran baits containing Paris green and sodium fluoride in such amounts as to demonstrate that both materials may be used without danger to poultry (sodium fluoride being the less poisonous). The apple curculio [*Tachypterellus quadrigibbus*, Say] attacked certain varieties of apples in some orchards. The adult bores holes in the green fruit and excavates large cavities under the surface, causing the fruit to drop or develop deep conical pits at the points of attack. As the larvae develop only in fallen fruit, experiments are being made on the use of pigs and other means of destroying this fruit or preventing the development of the grubs in it.

The natural enemies of *Diabrotica vittata*, F., which is the most important pest of cucurbits in Iowa, are two Tachinid flies, *Senotainia trilineata*, Wulp, and *Chaetophleps setosa*, Coq., and a Nematode, *Howardula benigna*, Cobb, while the Pentatomid, *Podisus maculiventris*, Say, has been found feeding on the adults. The dust that has given the most satisfactory control during the last three years is a mixture of gypsum and calcium arsenate, which acts as a poison and repellent. This may be applied by hand or by means of a shaker made by punching many small holes in the bottom of a can. From 8 to 12 dustings are necessary according to weather conditions and the severity of the infestation, the first application being made when the seedlings start to break through the surface of the soil.

RICHARDSON (C. H.) & SMITH (C. R.). **Toxicity of Dipyriddyis and certain other Organic Compounds as Contact Insecticides.**—*Jl. Agric. Res.*, xxxiii, no. 7, pp. 597–609, 5 figs., 6 refs. Washington, D.C., 1st October 1926. [Recd. January 1927.]

The following is the authors' summary: A crude oil containing several isomeric dipyriddyis and other substances has been prepared from pyridine and sodium. The physical properties and chemical relationships of the dipyriddyis are discussed and their similarities to pyridine and nicotine pointed out.

In spraying experiments with six species of Aphids, this crude dipyriddyil oil was found to be highly toxic, but was surpassed in this respect by nicotine.

In submergence experiments, the crude oil was more toxic than nicotine to the larvae of two species of Coleoptera (*Leptinotarsa decemlineata*, Say, and *Lema trilineata*, Oliv.) and one species of Lepidoptera (*Ephestia kühniella*, Zell.), and less toxic than nicotine to the adult of one species of Coleoptera (*L. decemlineata*) and to silkworm larvae.

Crude dipyriddyil oil, in the present experiments, was not injurious to plants infested with Aphids at concentrations sufficient to kill the Aphids.  $\alpha\alpha$ ,  $\beta\beta$ ,  $\beta\gamma$ , and  $\gamma\gamma$  dipyriddyis, which occur in the crude dipyriddyil oil used in these tests, were not so toxic to *Aphis rumicis*, L., as the crude oil itself;  $\gamma\gamma$  dipyriddyil is much less toxic than the other three compounds.

Several preparations from the crude oil proved to be highly toxic to *Aphis rumicis* on nasturtium plants. Although unquestionably impure, they approached closely the toxicity of nicotine for this Aphid. Work is being continued on these preparations.

The toxicities of 16 other organic compounds tested during this investigation are given also. Several of these are related to the dipyriddyis or to nicotine. As compared with dipyriddyil oil, they showed no appreciable toxicity.

Crude dipyriddyil oil was more toxic to certain insects used in this investigation, and it is possible that it may also prove more effective for the practical control of some injurious insects.

WAITE (M. B.) and others. **Diseases and Pests of Fruits and Vegetables.**—*U.S. Dept. Agric. Yrbk.* 1925, pp. 453–599, 92 figs., 24 refs. Washington, D.C., 1926. [Recd. January 1927.]

This comprehensive review of pests and diseases in relation to the production of fruit and vegetables in the United States contains much information of historical interest in connection with the origin of many of the most important insect pests of these classes of crops and the development of control measures.

HOWARD (L. O.). **Report [1925–26] of the Entomologist.**—*U.S. Dept. Agric.*, 30 pp. Washington, D.C., 1926. [Recd. January 1927.]

Much of the information in this report, which presents a general survey of the situation in the United States with regard to insect pests in 1925–26 on the same lines as in the previous year [*R.A.E.*, A, xiv, 151], has already been noticed. In Indiana, the deformation of peaches known as "cat-face" [*R.A.E.*, A, xiv, 260] is found to be caused not only by two species of *Lygus* but also by two species of *Euschistus*.

The plum curculio [*Conotrachelus nenuphar*, Hbst.] in that State develops a partial second generation in certain seasons; infestation at harvest time, however, generally results from late oviposition of the longest-lived adults of overwintering beetles. A test of baits for the codling moth [*Cydia pomonella*, L.] in Washington showed apple ferment to be the most attractive, though good results were also obtained with a ferment of molasses and yeast. Essential oils did not show much promise against this insect. For the control of the pecan nut case-bearer [*Acrobasis carvayae*, Grote] in Texas, the best results were obtained with two applications of a spray containing 1 lb. lead arsenate powder and 4 lb. hydrated lime to 50 U.S. gals. water, at intervals of 10 days soon after the nuts had set, and a third application about 4 weeks later. This reduced the damage from 39 to 10 per cent. More than 1 lb. lead arsenate gave no better results [cf. *R.A.E.*, A, xv, 71], but a reduction of over 20 per cent. of injury was obtained with three applications of an arsenical dust composed of 10 per cent. lead arsenate and 90 per cent. hydrated lime.

Blueberries (of which the crop from Washington County, Maine, alone is valued at more than £200,000 annually) are seriously damaged by the blueberry maggot [*Rhagoletis pomonella*, Walsh], the larvae, when abundant, being found in blueberries after canning and rendering them unfit for food. The general practice has been to burn a portion of the blueberry ground every third year, in order to destroy the pupae in the soil; the value of this practice is now doubted, but burning will at least have the advantage of reducing the food supply of the insect during the following two seasons. The extent of the benefit will depend upon the ability of the flies to migrate to unburned areas or on the possibility of the puparia surviving in the soil for 3 years. Breeding experiments indicate that the flies emerge chiefly during July and early August. Calcium arsenate and lead arsenate dusts have been tried against the adults when feeding; they have proved valuable in orchards, and appear promising on large areas, but much of the blueberry barrens are low-yielding lands and cannot bear the cost of expensive measures.

There has been a marked increase in abundance of the gipsy moth [*Porthetria dispar*, L.] throughout the eastern part of the infested region, a number of isolated outbreaks in widely scattered areas having been reported. The Cape Cod infestation has grown far more serious since the previous year [*R.A.E.*, A, xiv, 151], and it is estimated that 47,000 acres were completely defoliated and 11,000 acres partly defoliated during the year under review. Less infestation was found in the barrier zone than in previous years, and the quarantine on many towns has been lifted. In New Jersey, light sprayer trucks proved very useful when pressures not exceeding 400 lb. were needed, and in places where these could not be connected directly with the water supply portable triplex pumps driven by small petrol engines were used. These could fill a 400-U.S.-gallon tank in about 15 minutes by pumping through a 2,000 ft. hose line, if the water had not to be forced up too great an elevation. More than 125,000 parasites, mostly in the form of Tachinid puparia, were imported from various parts of Europe during 1926, while over 3,500,000 parasites have been bred in the laboratory and liberated in badly infested territory. Lead arsenate sprays, either with or without fish-oil as an adhesive, protected the trees from defoliation, and dusting woodlands from aeroplanes, even under adverse conditions, gave promising results. The brown-tail moth [*Nygmia phaeorrhoea*,

Don.] was somewhat more abundant than in the previous year, parasitism averaging slightly less. The alfalfa weevil [*Hypera variabilis*, Hbst.] has extended to eastern Wyoming, and the most serious outbreak since 1921 occurred in western Nevada and northern Utah; in the former region land machines were used for dusting and in the latter aeroplanes, both with encouraging results. In experiments against bulb flies it was found that with carbon bisulphide at normal atmospheric pressures the time factor necessary for sufficient vaporisation resulted in severely injured bulbs. Experiments with fumigation under vacuum gave good results against flies and mites, but injured the bulbs; tests are being made with hydrocyanic acid gas. Investigations in Hawaii showed that cooking bananas are particularly susceptible to infestation by the fruit-fly [*Ceratitis capitata*, Wied.] and that onions are very resistant.

The Mexican bean beetle [*Epilachna corrupta*, Muls.] is continuing to spread eastward. In New Mexico, successful hibernation only occurs in the region of yellow pine (*Pinus ponderosa*) where oak trees are associated. Above this region, during the last two years, 15,500 beetles perished in hibernation and none survived, while below this region, in the belt of pinyon [*Pinus edulis*], only 30 beetles emerged in a cage containing 2,500 insects. Tests with marked beetles confirmed the theory that this insect follows prevailing winds and flies either up or down canyons, which are the principal migration paths. By trapping migrating adults of the pea aphid [*Illinoia pisi*, Kalt.] on sticky screens it has been found in Wisconsin that there is usually a heavy migration about 10th July, which greatly complicates control measures, as it occurs when most of the pea plants are in pod. The yield from fields swept with an aphidozer was in the majority of cases less than that from untreated ones, though the peas were of higher grade. In California, three applications of nicotine dust gave very successful control in one field. The situations selected for oviposition by the twelve-spotted cucumber beetle [*Diabrotica duodecimpunctata*, Oliv.] are found to be influenced by the quantity of moisture in the soil and its physical condition, a soil with cultivated or roughened surface being preferred if sufficient moisture is present. The seed corn maggot [*Phorbia ciliatella*, Rond.] does not normally oviposit on freshly cut pieces of seed potato, nor do the young maggots feed on healthy seed potatoes, but they enter and develop without difficulty in decayed spots, and apparently attack generally follows injury to seed potatoes. Planting methods that preserve the seed and prevent rotting or scorching throughout the germination period will therefore lessen injury by this insect. The turnip or Australian tomato weevil [*Listroderes obliquus*, Gyll.] has continued to spread and is found in California attacking carrots; apparently the extension occurs chiefly in autumn, winter and early spring. Arsenicals both in spray and dust forms have proved valuable remedies. It was found in Louisiana that practically all eggs of the tomato fruit-worm [*Heliothis obsoleta*, F.] occurred on the terminal growths of tomato, the taller plants being preferred for oviposition. In North Carolina, success was obtained by the use of mole-cricket bait, modified by the addition of a small quantity of molasses; this was scattered over the plants, and the larvae in migrating from fruit to fruit came in contact with and devoured the bait. The latest work on the potato leafhopper [*Empoasca fabae*, Harr.] has demonstrated that a spray of Bordeaux mixture gives a higher yield of potatoes than does copper-sulphate and

lime dust ; growers are apparently of the opinion, however, that the greater ease and quickness of dusting more than outweigh the advantages of spraying. The Porto Rico mole-cricket [*Scapteriscus vicinus*, Scud.], both in cultivated and grass-land conditions, was successfully controlled by poison baits [cf. *R.A.E.*, A, xiv, 68]. By incorporating molasses at the mill the composition of the bait has been slightly changed to obviate fermentation ; the improved bait seems to have more lasting qualities and does not require the addition of water before application. Against the pepper weevil [*Anthonomus eugenii*, Cano] cage tests with both calcium arsenate and sodium silicofluoride gave promising results, and under field conditions their use practically doubled the yield of sound peppers [*Capsicum*]. A study of the sugar-beet leafhopper [*Eutettix tenella*, Baker] in the desert lands of the north-west States has shown that it does not migrate from its desert breeding-grounds if suitable food is available there, and that the osmotic concentration of the sap of its food-plants gives an index of the suitability of such plants as food. Against the strawberry weevil [*Anthonomus signatus*, Say] sulphur-arsenical dusts gave good results but in some cases scorched the tender foliage ; Bordeaux-arsenical dust gave about equal results without injury. The dust was more effective when applied to dry plants than to wet ones. On 160 acres an expenditure of £40 on material was estimated to save the growers nearly £5,000. Tobacco in Kentucky suffered from wireworms to the extent of 50 per cent. of the crop, especially when grown on former grass-land. Poison baits proved much more effective on freshly harrowed land than on crusted soil, and under favourable conditions gave 90 per cent. control. The species of *Crambus* observed damaging tobacco in Virginia [*R.A.E.*, A, xiv, 154] is *C. caliginosellus*, Clem. ; it continues to be a major pest. The injury was reduced to less than half by one application of poison bait at a cost of about 1 per cent. of the crop value. Amyl salicylate has been found to be a powerful attractant for adults of the tobacco hornworm [*Protoparce*], and experiments are to be made in the hope of attracting the moths to poison bait with this substance before they oviposit on tobacco. Against the cotton boll weevil [*Anthonomus grandis*, Boh.] investigations on the attractive properties of certain constituents of the cotton plant have been continued [cf. *R.A.E.*, A, xiii, 570], and certain dilutions of trimethylamine and ammonia have also proved attractive in laboratory tests ; the value of these in practical field use is to be determined. While it is expected that several hundred thousand acres of cotton will be dusted by aeroplane, special attention has been given to the development of motor-operated high air-velocity machines for ground dusting. The cotton leaf perforator [*Bucculatrix thurberiella*, Busck] is doing increasing damage each year and is now estimated to destroy from 15 to 30 per cent. of the crop.

The forestry situation is reported upon, the most important investigation having been recorded elsewhere [*R.A.E.*, A, xiv, 242]. It was found that defoliation of the western yellow pine [*Pinus ponderosa*] by the Pandora moth [*Coloradia pandora*, Blake] greatly increased the trees' susceptibility to bark-beetle infestation. The eastern tip moth, *Rhyacionia frustrana*, Comst., accidentally introduced into Nebraska, has been causing very serious damage ; an attempt is being made to treat nursery stock in order to prevent dissemination of the moth into new areas, and about 20 species of parasites have been introduced. In Virginia, a shipment of the Chalcid egg-parasite,

*Tetrastichus xanthomelaenae*, Rond., has been received and liberated against the elm leaf beetle [*Galerucella luteola*, Müll.].

The year's work on apiculture is recorded.

SMITH (L. B.). U.S. Bur. Ent. **The Japanese Beetle.**—*11th Ann. Rept. New Jersey State Dept. Agric.* [1925-26], pp. 71-76. Trenton, N.J., September 1926. [Recd. February 1927.]

This report briefly summarises the results of further investigations [cf. *R.A.E.*, A, xiv, 154] on the control and bionomics of the Japanese beetle, *Popillia japonica*, Newm., carried out during the year ended 30th June 1926. Lead arsenate coated with lead oleate [*R.A.E.*, A, xiii, 631] is recommended for spraying shade trees and ornamental plants, but it is unsafe as a general spray for fruit trees, as too much arsenic may adhere to the fruit at harvest time. Spraying less than an acre of an orchard with geraniol resulted in the attraction of the beetles for nearly half a mile from the leeward side within 15 minutes of application, enabling large numbers to be killed in a small area by spraying with a contact insecticide, for which purpose pyrethrum soap [*R.A.E.*, A, xiv, 656] has given good results. Extensive tests have been made with soap emulsions of a number of organic compounds as contact insecticides, and the results with orthotoluidine have been promising. Large numbers of beetles have been captured in traps baited with geraniol, but the use of this method is not yet recommended. Certain odours, particularly tar, are distinctly repellent to the beetles. Many possible substitutes for lead arsenate as a stomach poison for the beetles have been investigated; the silico-fluorides of barium and potassium and lead fluoride show promise. The alcoholic carbon bisulphide emulsion used for soil treatments against the larvae [*R.A.E.*, A, xiv, 155] proved unsatisfactory under commercial conditions, and an emulsion of carbon bisulphide with sodium oleate to which a small amount of resin is added has been developed; the physical properties of this emulsion are better, it gives a complete kill of larvae at a greater depth, and it is less liable to injure plants. The effectiveness of lead arsenate in the soil as a stomach poison for the larvae [*R.A.E.*, A, xiv, 526, 530] apparently depends entirely upon the thoroughness with which the powder is mixed with the soil. The rearing and liberation of parasites has been continued. Scoliid wasps of the genus *Tiphia* were successfully imported from China and Japan as adults and liberated in large numbers. Shipments of *Dexia ventralis*, Aldr., were received in the spring of 1926, and it is anticipated that this valuable parasite can be established. The work of quarantine and inspection against *P. japonica* is discussed; the area under quarantine was increased in December 1925 from 5,122 to 6,047 square miles, the spread during 1925 tending to be in a northerly direction.

SPRINGER (J. R.). **The Japanese Beetle.**—*Qtrly. Bull. State Plant Bd. Florida*, xi, no. 1, pp. 1-7. Gainesville, Fla., October 1926. [Recd. January 1927.]

This is a brief account of the bionomics and control of the Japanese beetle [*Popillia japonica*, Newm.] in New Jersey. The author emphasises the danger of its introduction into Florida in spite of the

precautions that are being taken to prevent its spread. Under greenhouse conditions in New Jersey adults of *P. japonica* have been reared in December from eggs laid in June, and it therefore seems probable that if it became established in Florida it would have two generations a year.

WATSON (J. R.). **Reports of the Entomologist.**—*Florida Agric. Expt. Sta., Repts. 1918-19 & 1919-20*, pp. 50R-59R & 20R-28R. [Gainesville, Fla., 1925?] [Recd. January 1927.]

The bulk of the information in these reports, published several years after the period with which they deal, has been noticed elsewhere. Pests occurring during the period that have not been recorded from Florida in recent years in this *Review* were: *Nezara hilaris*, Say, attacking the stalks of pigeon pea [*Cajanus indicus*], *Corythuca gossypii*, F. (cotton lace-bug), on castor bean [*Ricinus communis*], *Anisota stigma*, F., defoliating oaks and subsequently attacking maize and melons, and a predacious bug, *Euthyrhynchus floridanus*, L., which is usually a very beneficial insect, reported as preying on honey-bees.

OSBORN (E.). **Report of the Assistant Entomologist.**—*Florida Agric. Expt. Sta., Rept. 1918-19*, pp. 60R-65R. [Gainesville, Fla., 1925?] [Recd. January 1927.]

The Coreids, *Leptoglossus phyllopus*, L., and *Acanthocephala femorata*, F., are common pests in Florida, attacking a great variety of cultivated and wild plants, on which the punctures they make produce brown spots. The adults of *L. phyllopus* hibernate under the leaves of thistles, becoming active at the beginning of March, and mate after feeding for a few days on the thistles. Oviposition begins 3-4 days after mating, the eggs being laid in rows of 10-20 on the stems and ribs of the leaves of the food-plant, which, on account of the duration of the immature stages, needs to be available for a longer period than are most vegetable crops. The eggs hatch in 9 days, and the first moult takes place an hour after hatching; the second instar lasts 2-3 days, the third 7-14 days, the fourth 24-28 days, and the fifth 30-32, the whole life-cycle occupying 84-88 days. The adults that have hibernated disappear by about the middle of April, and those of the spring generation are common by about the second week in June; they can be collected by hand or shaken into nets or pans containing kerosene in the early morning when they are sluggish. Sunflowers can be used as a trap-crop [R.A.E., A, xi, 199].

The adults of *A. femorata* are believed to hibernate in woods, and appear on thistles towards the end of March; mating and oviposition take place soon after, the eggs being laid singly or in small groups on the lower surface of the leaves of thistles or other Compositae or radish. The eggs hatch in 12 days, and the life-cycle is probably completed in 85-90 days. The control measures recommended are the same as for *L. phyllopus*.

The Tachinid, *Trichopoda pennipes*, F., attacks both *L. phyllopus* and *A. femorata*, about 66 per cent. of the adults of the former bug taken in the early spring being parasitised. *A. femorata* is also parasitised by *T. lanipes*, F., and *Sarcophaga sternodontis*, Towns., the total

parasitism of the first adults taken in the spring amounting to about 14–16 per cent. Notes are given on the biology of *T. pennipes* [cf. *R.A.E.*, A, xii, 213] and of *T. lanipes*, which is similar. The life-history of *S. sternodontis* resembles that of the two Tachinids, but the pupal period is longer, lasting about 25 days, as compared with 9–15 days.

WATSON (J. R.). **Report of the Entomologist.**—*Florida Agric. Expt. Sta., Rept. 1923–24*, pp. 76R–83R, 1 fig. [Gainesville, Fla., 1925.] [Recd. January 1927.]

Much of the information in this report, which includes the report of the Assistant Entomologist, A. H. Beyer, has already been noticed [*R.A.E.*, A, xii, 405, 492; xiii, 324; xiv, 629; etc.]. A single application of 3 gals. lime-sulphur and  $\frac{3}{4}$  pint nicotine sulphate in 150 gals. water to orange trees in full bloom resulted in the number of fruit injured by scarring by *Frankliniella tritici bispinosa*, Morg. (Florida flower thrips) being reduced to less than one-third of those on unsprayed trees. *Crotalaria*, which is being used as a cover crop in citrus groves, appears to be immune from root-knot Nematode [*Heterodera radicola*, Greeff]; the immature pods are very attractive to *Nezara viridula*, L., which prefers them even to the fruit of tangerines [*Citrus nobilis*], so that its presence in a grove serves as a protection rather than a menace to the fruit on this account. Tests with sulphur for the control of *H. radicola* showed that the application of 200–500 lb. to the acre produced a marked diminution in the number of Nematodes in the soil and stimulated plant growth, but larger amounts had an injurious effect on plants planted later and did not eradicate the Nematodes. Of several sprays tested for the control of mealybugs [*Pseudococcus*], the most satisfactory was nicotine sulphate (1 : 800) in lime-sulphur solution at the strength used for rust mite [*Phyllocoptes oleivorus*, Ashm.] [1 part to 70 parts of water at 32° Bé.].

NEWELL (W.). **Preliminary Report on Experiments with the Tung-oil Tree in Florida.**—*Florida Agric. Expt. Sta., Bull.* 171, pp. 189–234, 20 figs., 6 refs. Gainesville, Fla., May 1924. [Recd. January 1927.]

The tung-oil tree, *Aleurites fordii*, was introduced into California from China, by means of seeds, in 1905, and young trees were subsequently sent from California to Florida and other southern States. The seeds produce an oil that is used extensively in the manufacture of paints and varnishes. Only three pests have so far been found to attack this tree in Florida. The roots of seedlings have been seriously injured by *Heterodera radicola*, Greeff, but damage by this Nematode could be avoided by rejecting nursery trees showing signs of infestation, planting in uninfested soil, and using as cover crops only plants that are immune or highly resistant to it, such as *Crotalaria* and velvet beans [*Stizolobium*]. *Iceya purchasi*, Mask. (cottony cushion scale) has been found from time to time on the trees, but the infestations have not been more severe than on other plants, and this scale is kept under control by the Australian Coccinellid [*Cryptolaemus montrouzieri*,

Muls.]; infested nursery trees should, however, be scrubbed with a solution of fish-oil soap before planting out. *Aspidiotus lataniae*, Sign., which is common on palms and *Casuarina* in Florida, but of slight economic importance, has been found on tung-oil trees.

BEYER (A. H.). **Controlling Chinch Bugs with Calcium Cyanide.**—*Florida Agric. Expt. Sta.*, Press Bull. 362, 2 pp. Gainesville, Fla., 1st August 1924.

St. Augustine grass [*Stenotaphrum secundatum*], which is largely used for lawns throughout Florida, is attacked by chinch bugs [*Blissus leucopterus*, Say] to such an extent that the plants are often killed, leaving brown patches in the turf. Warm and fairly dry weather in spring and autumn, when most of the eggs hatch, is favourable to *B. leucopterus*, and destructive outbreaks are sometimes prevented by prolonged rains, which favour the development of a fungus that attacks the bugs. The best control of *B. leucopterus* has been obtained by scattering calcium cyanide dust evenly over the lawns at the rate of 150 lb. to the acre; a second application 5 days later may be necessary. The calcium cyanide should be applied during the heat of the day with a dusting machine of the fan or bellows type, which gives a continuous flow, or it can be sifted from a can with a tight-fitting lid and perforations in the bottom.

CRUMB (S. E.). **Tobacco Cutworms and their Control.**—*U.S. Dept. Agric.*, Farmers' Bull. 1494, 13 pp., 11 figs. Washington, D.C., August 1926. [Recd. January 1927.]

Cutworms may be divided into two groups according to the stage in which they pass the winter. Among the species that attack tobacco *Lycophotia margaritosa*, Haw., var. *saucia*, Hb. (variegated cutworm), and *Agrotis ypsilon*, Rott. (greasy cutworm) hibernate as pupae, while *Feltia ducens*, Wlk. (dingy cutworm), *F. gladiaria*, Morr. (clay-backed cutworm), and *Euxoa messoria*, Harr. (dark-sided cutworm) are examples of those that pass the winter in the larval or egg stage. The seasonal history of these species is given for the States in which they occur most commonly, with a brief review of their natural enemies and the effect of climatic conditions on them.

A dust of 1 lb. Paris green to 25–60 lb. of a carrier such as flour or sifted wood ashes may be effective in moderate infestations, but is liable to injure the tobacco plants, especially in hot moist weather.

The author has come to the conclusion that sweetening is not necessary in cutworm baits, and recommends the following formula: 50 lb. wheat bran, 1 lb. Paris green or sodium fluoride, and enough water to moisten. Zinc arsenite or zinc ortho-arsenite are efficient at a slightly heavier dosage, and very finely powdered white arsenic will give good results at the rate of 2 lb. to 50 lb. bran, but is useless in the ordinary granular form. Lead or calcium arsenates do not give good results as cutworm poisons.

The bait should be applied to the hill at the rate of 3 lb. (dry weight) to 1,000 tobacco plants, or, in cases of severe infestation, it should be broadcast at the rate of 15–20 lb. an acre. In plant beds 4 lb. broadcast

is sufficient for 100 sq. yds; the application should be made several days before the plants are set out, or at least on the same day, and is best applied late in the evening. The best times for spring and autumn ploughing when cutworms are present are discussed, and the construction of vertical-sided and dusty-sided ditches for use against migrating cutworms is described.

ALLEN (H. W.). **Notes on some North American Species of *Achaetoneura* with a Description of one New Species (Diptera; Tachinidae).**—*Trans. Amer. Ent. Soc.*, lii, no. 3, pp. 187–198, 1 pl., 6 refs. Philadelphia, Pa., September 1926. [Recd. January 1927.]

The author considers that *Achaetoneura*, of which *A. frenchi*, Will., is the type species, should be separated from *Frontina*; the type of the latter genus, *F. laeta*, Mg., lays microtype eggs on foliage, according to Pantel, while the four North American species, *A. frenchi*, *A. aletiae*, Riley, *A. melalophae*, sp. n., and *A. archippivora*, Will., form a well-defined group in which the female reproductive system is adapted for larviposition on or in the host caterpillar.

*A. aletiae* has been bred from *Vanessa (Aglais) antiopa*, L., *Heliothis obsoleta*, F., *Alabama argillacea*, Hb., *Megalopyge opercularis*, S. & A., and *Phytometra (Autographa) oo*, Cram., in Mississippi, and undoubtedly contributes to the control of several other pests in the State. The flies are present from the middle of May to the end of November, becoming more abundant in the autumn. The female reproductive organs and method of larviposition are described; the female punctures the skin of the host caterpillar and simultaneously deposits a larva, still enclosed in an egg-shell, but the larva is thrust through the puncture and the egg-shell remains outside, covering the wound. The development of the larvae, as observed in *A. argillacea* and *Laphygma frugiperda*, S. & A., during September is described. The death of the host occurs in the last larval or pupal stage, about 5 days after it has been parasitised, and the parasite larva emerges 3–5 days later, and pupates in the soil at a depth of about half an inch, the pupal stage occupying 9–14 days.

*A. melalophae*, both sexes of which are described, is an important parasite of *Melalopha inclusa*, Hb. (poplar tent-maker), which is periodically abundant on poplars and willows in the southern United States; as many as 60 per cent. of the caterpillars of the last two instars have been found to be parasitised by it. The parasite has been reared in Mississippi and Ohio, and is probably widely distributed in the eastern United States. As in the case of *A. aletiae*, the death of the host occurs in the last larval or pupal stage, before the parasite larva is mature. In the field puparia were found in the tents of the host on several occasions, but in the insectary the larvae pupated in the soil at a depth of about half an inch. The maximum duration of the larval stage is probably 12 days in July and August; the pupal stage in those months lasted 6–9 days for males and 9–11 days for females. The parasite has at least two generations a year, and passes the winter as a larva within the pupa of the host or as a pupa in the soil. The first adults appear in early spring and the last in October. From two to five larvae can mature in a single caterpillar. When eggs of *Phorocera floridensis*, Towns., were laid on caterpillars that had been previously parasitised by *A. melalophae*, the larvae of the former parasite were unable to mature, as the host was killed too soon by

the more advanced larvae of the latter, which were not, however, affected by the superparasitism. The Chalcid, *Perilampus hyalinus*, Say, attacks the larvae of *A. melalophae* when they are still in the body of the host, and the adults emerge from the puparia.

HUBER (L. L.) & NEISWANDER (C. R.). **The European Corn Borer in Ohio.**—*Bi-mthly. Bull. Ohio Agric. Expt. Sta.*, xii, no. 1, pp. 3-13, 7 figs. Wooster, Ohio, 1927.

A popular account is given of the history of the European corn borer [*Pyrausta nubilalis*, Hb.] and its bionomics and control in Ohio.

**Fruit Crop Protection for 1926.**—*Univ. Delaware, Sch. Agric., Extens. Circ.* 21, 8 pp. Newark, Del., February 1926. [Recd. January 1927.]

Spray programmes for the control of pests and diseases of apples, peaches and grapes in Delaware are given, together with instructions for making several spray mixtures.

DOZIER (H. L.). **Department of Entomology.**—*Delaware Agric. Expt. Sta.*, Bull. 147 (Ann. Rept. 1925-26), pp. 17-20. Newark, Del., December 1926.

The codling moth [*Cydia pomonella*, L.] is the most important insect pest in Delaware, and serious losses, particularly to late apples, are caused by larvae of the second brood, which enter the fruit from the side; the first brood larvae, which attack early apples, can usually be controlled by accurately timed sprays. In 1926 the calyx sprays were applied with great thoroughness, but on account of the cold spring the moths emerged late, and the apples were about an inch in diameter by the time that the first larvae hatched, so that they entered the fruit from the side, rarely attempting to enter at the calyx end. There is considerable variation in the susceptibility of varieties of apples to injury by codling moth larvae, depending apparently upon the thickness of the skin of the fruit; three varieties are named that were almost free from attack while the apples on surrounding trees of other varieties were badly damaged. It has been found that very large numbers of larvae of *C. pomonella* and of the oriental peach moth [*C. molesta*, Busck] emerge from the apples after they have been picked and spin their cocoons in the picking baskets, and that these baskets, which are frequently allowed to lie in open sheds and packing houses, provide an important source of infestation in the spring. Records of the emergence of moths from some picking baskets stored in a cellar are given; these show that mixed infestations of *C. pomonella* and *C. molesta* occur on apple, and that the emergence of the adults of the latter is somewhat earlier in the spring than that of the former. The maximum emergence of *C. molesta* occurred about 10th June, and that of *C. pomonella* about 8th July. Parasites of *C. pomonella* taken in a packing house were, in order of abundance: *Ascogaster carpocapsae*, Vier., *Phanerotoma tibialis*, Hald., *Bracon carpocapsae*, Cushman., and *Dibrachys boucheanus*, Ratz.

The grape leafhopper [*Erythroneura comes*, Say] is an important pest of grapes in Delaware, and has been becoming increasingly abundant. In the autumn of 1925 large numbers of adults on grape foliage were

killed by the fungus, *Entomophthora sphaerosperma*, but they appeared as abundantly in vineyards in the latter part of May 1926 as in the previous year; the fresh condition of these adults suggested the possibility that they belonged to a new generation that had been produced on some other food-plant on which the adults that had hibernated had laid eggs. Nicotine sprays did not control the adults very satisfactorily, and the prevailing strong winds made dusting impracticable for the greater part of the summer; calcium cyanide dust was demonstrated to have better killing powers than nicotine-lime dust, but a few growers used 2 per cent. nicotine-lime dust with good results, the cost being about 20s. an acre.

FLINT (W. P.). **Insect Hazard to Illinois Field Crops.**—*Trans. Illinois State Acad. Sci.*, xviii, pp. 75–81, 1 map. Springfield, Ill., 1925. [Recd. January 1927.]

An attempt is made to show the annual chances of injury to Illinois field crops from insects causing commercial damage by means of tables compiled from data covering a period of 65 years. A list of the insect pests is arranged under each crop, and figures are given showing the percentage of damage done by each in the northern, central and southern parts of the State. These figures represent the estimated hazard for an average year under average farm conditions.

THATCHER (R. W.). **Forty-fifth Annual Report for the fiscal Year ended June 30th, 1926.**—*New York Agric. Expt. Sta.*, 69 pp. Geneva, N.Y., 1927.

Much of the information in the entomological section of this report (pp. 36–44) has been noticed previously from bulletins and other sources. Tests with oil sprays indicate that an 8 per cent. home-made lubricating oil emulsion is efficient against the eggs of *Tortrix* (*Archips*) *argyrospila*, Wlk. (fruit-tree leaf-roller); if this is used as the buds are swelling and not later than when the green tissues show at the tips, a single application once every few years apparently produces no permanent ill effect on the health of the tree. The oil treatment may be used as an emergency measure when 15–20 per cent. of the previous apple crop has been injured by *T. argyrospila*. Continued experiments indicate that this moth can be controlled by thorough and timely spraying with arsenicals, though it is necessary to make one or two applications in addition to those on the ordinary spray calendar during the period when the eggs are hatching (this normally occurs from the time the blossoms show pink until they drop). This pest seems to be declining in importance, partly owing to better methods of spraying and possibly to the activities of natural enemies; these include a recently discovered Chalcid parasite, *Trichogrammatomyia tortricis*, Gir., which was very active during the spring of 1926.

During a normal season the second brood of the codling moth [*Cydia pomonella*, L.] is only a partial one. The hatching of the first brood may extend over a period of seven weeks, and superficial injury to apples can be prevented by two cover sprays, one 2½ weeks and the other 5 weeks after the calyx period. Continued experiments showed that lubricating oil emulsions are not on the whole so effective in controlling the rosy aphid [*Anuraphis roseus*, Baker] as lime-sulphur containing nicotine sulphate [*cf. R.A.E.*, A, xiii, 255].

Ecological investigations on the grape-berry moth [*Polychrosis vileana*, Clem.] showed that the foci of infestation were usually coincident with an area where the snow covering in the previous winter had been practically continuous owing to drifts, which indicates that a considerable degree of freedom from this pest can be secured by avoiding trees and other high objects in the vicinity of vineyards.

Sodium fluosilicate used pure or in dilutions of one to five of hydrated lime against the striped cucumber beetle [*Diabrotica vittata*, Say] caused severe injury to plant growth. The most practical method for destroying the beetles is to drive them from the main crop by dusting to a trap crop of squash seedlings; the next day they may be killed by means of box fumigators, using a dust of 4-5 per cent. nicotine content and an exposure of 3-5 minutes. The efficiency of squash plants as traps is generally diminished as soon as the cucumber flowers open.

Experiments by other workers have indicated that the effect of dusts of tobacco and hydrated lime is more rapid under humid conditions, but dusting cauliflower seedlings wet with dew caused injury to the plants, especially when the mixtures contained a large proportion of lime.

A species of Collembola, a new pest of cabbage seedlings, may be destroyed by tobacco dust.

ESSIG (E. O.). **Insects of western North America.**—8vo, xi+1035 pp., 766 figs., refs. New York, &c., The Macmillan Co., 1926. Price 42s.

This comprehensive work deals with the insects and other terrestrial arthropods of that part of North America lying west of the Rocky Mountains and north of Mexico, and extending to Alaska in the north. The first three chapters (54 pages) are devoted to the Arachnida and smaller classes of Arthropoda, and the classification of the Insecta, with keys to the orders, and the remaining 25 chapters to the orders of Insecta; keys to the families are given in nearly all cases, and for some families all the species known to occur in western North America are listed. Concise accounts of the biology of a very large number of species and groups of insects are given, special attention being paid to those of economic importance, and control measures and a few of the most important natural enemies are indicated for such as are injurious. Many records of the hosts of parasitic Diptera and Hymenoptera are included in the sections dealing with those groups. The author states in the preface that each part of the book was submitted to a specialist for revision.

References to monographs of groups and accounts of the bionomics and control of individual species are given as footnotes. There are indices to the authors cited, to food-plants, and to insects and insecticides.

HAWKES (O. A. M.). **On the Massing of the Ladybird, *Hippodamia convergens* (Coleoptera), in the Yosemite Valley.**—*Proc. Zool. Soc. London*, 1926, pt. 3, pp. 693-705, 1 pl., 5 refs. London, September 1926.

*Hippodamia convergens*, Guér., has been found to hibernate in large masses at a variety of altitudes in the Yosemite Valley, but what

determines the altitude is not yet known. The insects respond by movement to both light and heat stimuli, the capacity to do so depending on the interval following the beginning of hibernation.

MORRISON (H.). U.S. Bur. Ent. **An apparently new Sugar-cane Mealybug.**—*Jl. Agric. Res.*, xxxiii, no. 8, pp. 757-759, 1 fig. Washington, D.C., 15th October 1926. [Recd. January 1927.]

*Ripersia raditicola*, sp. n., described from Cuba, was found on the roots of sugar-cane, *Echinochloa colona*, and other grasses.

DOZIER (H. L.). **Annual Report of the Division of Entomology.**—*Ann. Rept. Insular Expt. Sta., Rio Piedras, Porto Rico, 1924-25*, pp. 115-124. San Juan, P.R., 1926. [Recd. January 1927.]

In an experiment with *Lachnosterna portoricensis*, Smyth, a mortality of 75 per cent. was obtained with 75 cc. carbon bisulphide emulsion in 12½ U.S. quarts water sprinkled over 12½ sq. ft., as against a natural mortality of 32 per cent. in the untreated half of the cage.

The sweet potato bug, *Corecoris (Spartocera) batatas*, F., was abundant from September to November. Bugs in cages were all killed by the fungus, *Sporotrichum gloeosporoides*. The eggs are laid on the stem, or sometimes on the lower surface of the leaves of the sweet potato plant; the eggs and young nymphs are described. Three examples of the Tachinid, *Trichopoda pennipes*, F., were reared from nymphs and adults. Nymphs of *Corecoris (Spartocera) fuscus*, Thunb., were found on *Momordica*. Nymphs emerged on 15th November from eggs laid on 28th October; the process of emergence and a description of the eggs and nymphs are given.

Extensive outbreaks of *Remigia (Mocis) punctularis*, Hb. (*repanda*, auct.) occurred on malojillo [*Panicum barbinode*] and young sugar-cane during October and November, but were controlled by parasites. In September, *Sipha flava*, Forbes (yellow sugar-cane aphid) seriously damaged Uba cane; in one locality it was successfully controlled by 3 per cent. nicotine dust. The unusual and heavy rains in October enabled the cane to outgrow the attacks of the Aphid, which was reduced by natural enemies. Uba cane two months old was attacked by the larvae of *Elasmopalpus lignosellus*, Zell. (lesser corn stalk borer) in one district.

Spraying *Citrus* with Bordeaux-oil emulsion is discussed, and the chief scale-insects are mentioned [*R.A.E.*, A, xiv, 300]. In addition, *Coccus hesperidum*, L. (soft brown scale) is abundant at times, but is controlled by the Chalcid, *Coccophagus lunulatus*, How. *Asterolecanium pustulans*, Ckll., caused serious damage to *Cassia fistula*, silver oak [*Grevillea robusta*], Humboldt's willow trees [*Salix humboldtiana*], oleander [*Nerium oleander*], fig and the ornamental shrub, *Allamanda nerifolia*. A large guano tree, *Ochroma lagopus*, about 1 ft. in diameter and 50 ft. high, was found infested with this Coccid from top to bottom with its large branches dying; as it was serving as a source of infestation for some mulberry trees near by it was cut down. A number of undetermined primary and secondary parasites have been reared from this material.

*Eucalymnatus tessellatus*, Sign., is recorded for the first time from Porto Rico heavily infesting a number of trees of *Calophyllum antillarum* in January and again in June.

In one locality *Saissetia oleae*, Bern., occurred abundantly on almen-dro [*Haemocharis curtiana*], but was controlled by two Chalcids, tentatively identified as *Lecaniobius cockerelli*, Ashm., and *Eupelmus saissetiae*, Silv., the larvae of which are found beneath the mother scale covering and apparently feed on the eggs.

Quarantine restrictions against fruit and fresh vegetables from Porto Rico proposed by the United States Federal Horticultural Board were not put into force, as it was pointed out that the Mediterranean fruit-fly (*Ceratitis capitata*, Wied.), is unknown in Porto Rico and *Anastrepha fraterculus*, Wied. (West Indian fruit-fly) has never been recorded from *Citrus* fruits.

A field of sugar-cane that had been cut on 1st February was attacked as it ratooned by *Pulvinaria iceryi*, Guér. By 7th April this scale had spread over the entire block, which was then sprayed with kerosene emulsion, 1 part to 10 of water. The cane foliage was not scorched and the application apparently gave good results. On 27th May, however, the older cane leaves in certain areas were dead or dying and infested with adult scales, which contained many eggs and numerous newly hatched larvae. The Coccinellid, *Cryptolaemus montrouzieri*, Muls., was abundant. Three parasites were reared from *P. iceryi*, viz., a primary parasite of the genus *Aphycus*, a hyperparasite, *Cheiloneurus* sp., and a few individuals of what is probably another hyperparasite. The rapid spread of the scale was probably due to the preponderance of hyperparasites, and may have been connected with the fact that no rain had fallen for three months.

The toad, *Bufo marinus*, has been imported from Jamaica against *Lachnosterna*, etc. It is hoped that it will breed in confinement in large enough numbers to become established when released, in spite of its destructive enemy, the mongoose.

*Dialeurodes citrifolii*, Morg. (cloudy-winged whitefly) has been found infesting foliage of orange in gardens, but has not yet been observed in commercial groves and is undoubtedly controlled by natural enemies. An undescribed species of *Encarsia*, which is a very effective parasite, has been reared in considerable numbers from *Aleurodicus* (*Metaleurodicus*) *minimus*, Quaint., on *Cestrum diurnum* and guava, and *Trialeurodes* (*Aleurodes*) *variabilis*, Quaint., on papaya (*Carica papaya*). Very large numbers of the Chalcid, *Eremocerus californicus*, How., were reared from the woolly whitefly [*Aleurothrixus howardi*, Quaint.] on almácigo [*Bursera gummifera*]. Several undescribed predacious Drosophilids and Coccinellids have been bred from Aleurodids.

*Heliothrips rubrocinctus*, Giard. (red-banded thrips) occurred on many food-plants, including mango, guava, blackberry, raspberry and grape, some varieties of which are more susceptible than others.

The possibilities of introducing sericulture into Porto Rico are discussed.

CHINA (W. E.). Notes on the Controversy respecting the Priority and Generic Status of *Eupteryx*, Curtis, and *Typhlocyba*, Germar (Homoptera, Jassoidea).—*Ann. & Mag. Nat. Hist.*, xix, no. 109, pp. 111–114, 2 refs. London, January 1927.

The author points out that the genus *Eupteryx* was described in January and *Typhlocyba* in July, 1883. This question of priority may affect the name of the family but has nothing to do with synonymy, as the two genera are distinct on the basis of validly selected types.

Van Duzee's assignation of *aurata*, L. [type of *Eupteryx*], as type of *Typhlocyba* is invalidated by the previous citations of Woodworth, Oshanin, and Distant in favour of *quercus*, F.

MUIR (F.). **New Species of African Meenoplidae (Fulgoroidea, Homoptera).**—*Ann. & Mag. Nat. Hist.*, xix, no. 110, pp. 197–208, 20 figs., 2 refs. London, February 1927.

The new species described include *Kermesia albipennis*, *Inxwala bergrothi* and *Anigrus stramineus* from Sierra Leone on African oil palm [*Elaeis guineënsis*].

TAYLOR (J. S.). **A Note on the Cotton Bollworms of South Africa.**—*Ent. Rec. & Jl. Var.*, xxxviii, no. 11, pp. 151–152, 9 refs. London, November 1926.

The most important of the bollworms attacking cotton in South Africa is *Diparopsis castanea*, Hamps. (Sudan or red bollworm), which occurs in all stages throughout the season, having four or five generations a year. Attacked bolls rarely mature, and if they are not completely hollowed out by the larvae they may ripen prematurely, in which case they are dwarfed and stunted, or they may be destroyed by boll rot. Cotton is the only crop attacked by *D. castanea*, which is confined to Africa; it has been found breeding on a few wild species of Malvaceae. Next in importance is *Heliothis (Chloridea) obsoleta*, F. (American bollworm), which attacks the squares, flowers, bolls and even leaves of cotton; infestations by this species are sudden and frequently severe. The spiny bollworms, *Earias insulana*, Boisd., and *E. biplaga*, Wlk., attack the squares, flowers and bolls of cotton and various wild Malvaceae, but do not usually cause serious damage in South Africa, although in 1926 fairly heavy infestations occurred. Both species have several generations a year, and the larvae pupate in cocoons attached to the food-plant or on the surface of the soil; hibernation occurs in the pupal stage, as with the two preceding species.

VAN BREEMEN (P. J.). **Strepenziekte en bladluizen.** [Mosaic Disease and Aphids.]—*Arch. Suikerind. Ned.-Indië; Meded. Proefst. Java-Suikerind.*, 1926, no. 23, pp. 910–912. Pasoeroean, 1926.

The relation between sugar-cane mosaic and *Aphis maidis*, Fitch, is outlined. In Java sexual forms of this Aphid do not occur. About 5 days elapse between the birth of the young and the production by them of the next generation. No less than 24 grasses, especially maize, which affords many sheltering places, are attacked in all parts of Java up to an altitude of about 6,600 ft. Observations on the abundance of this Aphid are given [*R.A.E.*, A, xiv, 592]; it is most numerous from December to February. In Java it is not feasible to prohibit the planting together of maize and sugar-cane, but the cane-fields must be kept clear of grasses.

TENGWALL (T. A.). **Witte wolluis en insecticiden.** [The White Woolly Aphis and Insecticides.]—*Arch. Suikerind. Ned.-Indië; Meded. Proefst. Java-Suikerind.*, 1926, no. 23, pp. 964–970. Pasoeroean, 1926.

In 1924–1925 0·4 per cent. of the sugar-cane fields in Java were severely infested by the white woolly aphis, *Oregma lanigera*, Zehnt.,

and 2.5 per cent. slightly. The injury seems more serious than it really is, and an existing estimate of a crop loss of about 20 per cent. is much too high. *O. lanigera* lives in colonies of larvae and alate and apterous adults, reproduction being parthenogenetic. Alate adults produce about 100 young, and apterous ones, 50 to 60. Spread is due to the alate adults and to ants. Natural enemies include a Hymenopterous parasite, Coccinellids and a small Lepidopterous larva, while severe drought and heavy rains destroy large numbers of the Aphids. Owing to the rapid growth of the cane at the time when the attack is most pronounced, i.e., in October-December, at the beginning of the rainy season, there are always some uninfested leaves at the top of the plant that enable it to flourish.

In young fields the attack can be controlled by removing centres of infestation, but this is almost useless in old fields, so that a careful examination should be made to discover the very first signs of attack. From July or August onwards infested leaves must be cut off, placed in bags and taken out of the field to be burnt or buried. Aphids that have fallen on the ground should be covered with earth. Experiments with various insecticides, including nicotine, gave conflicting results. On one estate a spray of milk of lime was apparently satisfactory. It is inadvisable to combat Aphids without identifying the species; on one estate about £3,300 was expended against *Aphis sacchari*, Zehnt., which is practically harmless.

MACHIDA (T.). On *Rhynchites* sp. [In Japanese.]—*Agric. Expt. Sta. Korea*, Rept. 6, pp. 487-490. Suigen, Korea, December 1926.

A weevil of the genus *Rhynchites*, which is distributed over south Korea, feeds in the adult stage on the twigs, buds, flowers and fruits of plum, peach and other fruit trees. There is one generation a year, the adults appearing at the end of March or in April. They live for 20-45 days and lay their eggs in the fruits. In September or late August the larvae enter the soil for hibernation. Some of them pupate before hibernation, but most do not do so until the next spring. The remedial measures recommended are the collection of the beetles and infested fruits, as well as covering the fruits with paper bags.

SHINJI (O.). On *Thoracaphis linderæ* n. sp. (Aphididae). [In Japanese.]—*Dobutsugaku Zasshi* [Zool. Mag.], xxxviii, no. 457, pp. 359-361. Tokyo, November 1926.

The winged and wingless viviparous females of *Thoracaphis linderæ*, sp. n., are described from Japan. This Aphid feeds on *Lindera umbellata* and *L. praecox*, the winged forms appearing in the second generation in the middle of May.

MURATA (J.) & IKEDA (T.). Studies on *Lestes temporalis* Selys (Odonata), a special Pest of Fruit Trees and Mulberry. [In Japanese.]—*Insect World*, xxx, no. 12, pp. 407-414. Gifu, December 1926.

The dragonfly, *Lestes temporalis*, Selys, occurs throughout the northern half of the mainland of Japan. The adults emerge from the end of July to the beginning of August and lay eggs in the tissues of young twigs of various fruit trees, mulberries and other plants near

water. On an average 43 eggs are laid in one twig; they do not hatch until the following May or June. The pronymphs can only survive if they are able to jump directly into the water, in which development to the adult stage is completed in 40–50 days. Oviposition may be prevented by spraying with lime-sulphur.

KUWANA (I.) & TANAKA (K.). **On *Anomala rufocuprea* Motch.** [*In Japanese.*]—*Insect World*, xxxi, no. 1, pp. 2–12. Gifu, January 1927.

The Rutelid, *Anomala rufocuprea*, Motch., is very common in Japan and attacks the leaves of a wide range of plants, soy-beans (*Glycine hispida*), which are preferred, being sometimes entirely defoliated. There is one generation a year, and in Yokohama the winter is passed in the second larval stage. The adults appear from July to October and feed at night rather than by day. Mating takes place on the plant during the day. One female lays less than 300 eggs during life, and these hatch in 13–38 days. There are three larval instars, the first lasting 14–30 days, the second 193–237 and the last 19–33, the larvae feeding on decayed material in the soil as well as on the roots of various plants. The pupal stage lasts 10–21 days. In the Kana-gawa Prefecture over 30 per cent. of the adults are parasitised by three species of *Tachina*.

[SPESIVTZEY (P. N.).] SPESSIVTSEFF (P.). **Eine neue Borkenkäferart aus Russland (*Orithotomicus starki* n. sp.).** [A new Bark-beetle from Russia.]—*Ent. Tidskr.*, xlvii, no. 4, pp. 217–220, 3 figs. Stockholm, 31st December 1926.

*Ips* (*Orithotomicus*) *starki*, sp. n., is recorded in Central European Russia from the thin upper branches of spruce in old stands. It hollows out a breeding chamber with two (rarely more) mother galleries.

[STARK (V. N.).] СТАРК (B. H.). **On the Bark-beetle Fauna of the Bryansk Government.** [*In Russian.*]—*Défense des Plantes*, iii, no. 4–5, pp. 330–339. Leningrad, November 1926.

This is an annotated list of 63 Scolytids recorded from the Government of Bryansk.

[STARK (V. N.).] СТАРК (B. H.). **The Influence of *Platysoma oblongum*, F., on the Development of *Myelophilus* (*Blastophagus*) *piniperda*, L., in Pine Stumps.** [*In Russian.*]—*Défense des Plantes*, iii, no. 4–5, pp. 339–342. Leningrad, November 1926.

During investigations on *Myelophilus piniperda*, L., in various forests of the Bryansk Government in 1925 it was found that wherever the predacious Histerid, *Platysoma oblongum*, F., was abundant, the Scolytid was either scarce or entirely absent. Studies of the factors influencing the activities of *P. oblongum* showed that under such conditions as those of forests on plateaux it may be relied on to control this bark-beetle. In pine forests with a shelter-wood of fir, 50 per cent. of the stumps should be barked early so as to concentrate the beetles on the remainder. In mixed stands of pine and fir the Histerid cannot be relied on for control. The stumps in which *M. piniperda* is heavily

parasitised should be painted with tar containing 5 per cent. kerosene, as this does not prevent the emergence of the parasites but repels *P. oblongum*, which apparently prefers the larvae and pupae of the parasites to the bark-beetles themselves.

If Longicorns are present, the Histerid will attack these in preference to *M. piniperda* or its parasites.

[STARK (N. K.).] (Старк Н. К.). **Some Observations on the Life of Longicorns.** [In Russian.]—*Défense des Plantes*, iii, no. 4-5, pp. 342-349, 18 figs. Leningrad, November 1926.

The larvae of different Longicorns make their main galleries at varying depths in the trunks of the trees. The majority of the injurious species may be divided into two groups—those living most of their larval life under the bark and only boring into the wood for pupation, and those that only spend a short time under the bark and pass most of the larval period in the wood. The arrangement of the different species within these groups by other authors is briefly reviewed. A short general account is given of the bionomics of a Longicorn larva, with a detailed account of the galleries of *Saperda scalaris*, L., *Plagionotus (Clytus) arcuatus*, L., and *Monochamus quadrimaculatus*, Metch.

The larvae of the first two species, which infest oaks, are described; their galleries are hookshaped in standing trees, running at first horizontally and then downwards in the wood. In felled trees the galleries may run in any direction. A similar arrangement of the galleries has also been noticed in the case of *Tetropium castaneum* var. *luridum*, L., boring in conifers, and probably occurs in other Longicorns. *Monochamus quadrimaculatus* attacks standing conifers, including pine, and also freshly felled unbarked trees, provided that they are at least 7 inches thick. The eggs are laid in depressions made through the bark into the succulent part of the bast. The larvae make irregular galleries in the bast and sapwood and very soon bore into the heartwood, where the gallery runs longitudinally for a short distance and then curves towards the bark, the complete gallery being crescent-shaped. The longitudinal portion in the heartwood is plugged with frass, so that in standing trees the galleries have to ascend, as the frass would otherwise fall on the working borer. On felled trees the eggs are always laid on the sides of the trunk near the ground. The transverse gallery rises in a slanting direction until it reaches the heartwood, where it continues horizontally in either direction, eventually curving towards the bark, preferably in an upward direction. This last part of the gallery is directed to the nearest possible point for emergence, whether this be the natural surface of the log or its cut surface. The direction of the gallery is changed whenever the log is moved, as the larvae always strive to reach the light. If, however, a larva continually alters the course of its gallery, it is often forced to pupate before reaching the surface, and the resulting beetle is unable to emerge. The formation of the galleries, therefore, clearly indicates whether the beetles attacked the standing trees or those on the ground. The observations on *M. quadrimaculatus* suggest a possible means of control by proper management of felled trees. Cutting them into small logs will prevent attack and in the case of previous attack will destroy a large number of the borers; turning the logs is also recommended.

[LEBEDEV (A. G.).] Лебедев (А. Г.). **A New Pest of Apples, *Lygaonematus moestus*, Zadd.** [In Russian.]—*Défense des Plantes*, iii, no. 4-5, pp. 349-352. Leningrad, November 1926; also *Prot. Plants in Ukraine*, ii, pp. 47-50. Kharkov, 1926.

In 1923 numbers of apple trees in the vicinity of Kiev were defoliated by the larvae of the sawfly, *Lygaonematus moestus*, Zadd. The eggs are laid along the edge of the leaf under the epidermis and hatch in about 3 days. The larvae are full-grown in about 11 days, and then enter the soil for pupation. Under experimental conditions pupation also occurred on the branches. There appears to be only one generation a year, the winter being passed in the soil. The first adults were noticed on 10th May; they begin oviposition at once and only live about a week. In 1924 the larvae were heavily parasitised by the Tachinid, *Ptychomyia selecta*, Mg., which prefers the full-grown larvae. Owing to the activities of this Tachinid, larvae of *L. moestus* could not be found on apple trees in the spring of 1925.

[RODD (E. A.).] Родд (Е. А.). **A New Pest of Wheat and Sunflowers.** [In Russian.]—*Défense des Plantes*, iii, no. 4-5, pp. 359-362, 4 figs. Leningrad, November 1926.

The Eumolpid, *Pachnephorus tessellatus* var. *sabulosus*, Gebl., causes considerable injury in the adult stage to wheat and sunflower seedlings in Altai (Siberia). The small leaf blades of the wheat are attacked from the edges and pieces may be cut off. Sunflower seedlings are attacked in the same way, the parts of the plants above ground being entirely eaten. Over 1,350 acres were infested in 1925, and the pest is probably widely distributed in the Government of Altai, at least in the steppe regions.

[SAVZDARG (E. E.).] Савздарг (Э. Э.). **Notes on the Biology of *Acidia heraclei*, L., as a Vegetable Pest.** [In Russian.]—*Défense des Plantes*, iii, no. 4-5, pp. 363-366. Leningrad, November 1926.

*Acidia heraclei*, L., caused considerable injury to parsnips (*Pastinaca sativa*) near Moscow in September 1924, and detailed observations were made in 1925 on its bionomics, a full account of which is given. The first females appeared in the field towards the end of May, and the first eggs were found about 20th June. They are laid on the lower surface of the leaves on the shaded side of the plant. The process is described in detail. The eggs may also be laid on celery (*Apium graveolens*), cow parsnip (*Heracleum sibiricum*) and, much less readily, on goutweed (*Aegopodium podagraria*). The first larvae were found in the field on 26th June. They begin at once to mine in the leaves, and if a leaf is not large enough to support the number of larvae present, some may migrate to other leaves. The very young larvae frequently die during this migration. After about 3½ weeks the larvae come out of the leaf and drop to the ground for pupation, which occurs in the soil, in the first generation at a depth of about ½ to 1½ inches, and in the second as deep as 4 inches. The first pupae were found in the field on 19th June, the adults appearing in the middle of July. The larvae of the second generation attacked parsnips and celery from the middle of August to the end of September. The infestation in

1925 was greatly reduced as a result of the activities of Braconid and Chalcid parasites.

Besides general cultural methods, the collection of infested leaves is recommended for the control of this pest.

During 1925 a Tortricid and the Elachistid, *Epermenia chaerophyllella*, Goeze, were also found among parsnips. The latter has two generations a year, the larvae of the first appearing in June and those of the second in August. They feed on the leaves under cover of a web.

[ANDREEVA (N. V.).] Андреева (Н. В.). **Biological Cycle of the Swedish Fly *Oscinella (Oscinis) frit*, L.** [In Russian.]—*Défense des Plantes*, iii, no. 4-5, pp. 367-378, 8 figs., 6 refs. Leningrad, November 1926.

The cultivation of barley appears to be diminishing in the northern strip of the black soil country in Russia. In certain districts of the Tula government, the area under this crop in 1916 was only a quarter of what it was in 1912, the reduction being apparently due to the damage caused by *Oscinella frit*, L. This is a preliminary report of the results of observations on the life-cycle of this pest recently begun at the Shatilov Experiment Station.

The adults usually appear in May, but the time of their emergence depends greatly on temperature conditions, as the hibernating larvae complete their development more quickly with increasing temperature and brilliant sunshine. The habits of the adults, the development of the reproductive organs of the females, and the different larval instars are described in detail. The eggs are laid under the first leaf sheath on the plant or on the soil immediately touching the plant. The larva bores between the leaf-sheaths and eventually into the stem, migrating upwards when the eggs are laid on the soil and downwards when they are laid on the plant. Pupation occurs in the stem. There are only two generations a year in Tula, the eggs of the second generation being laid at the end of July or beginning of August. The resulting larvae do not complete their development until the following spring.

[RUSANOVA (V. N.).] Русанова (В. Н.). **On the Biology and Colouration of some Species of the Genus *Eurydema*.** [In Russian.]—*Défense des Plantes*, iii, no. 4-5, pp. 378-383, 6 refs. Leningrad, November 1926.

During 1924 Pentatomids of the genus *Eurydema* were abundant on mustard and rape at the Saratov Experiment Station. The species concerned were *E. ornatum*, L., *E. festivum*, L., and *E. oleraceum*, L., as well as varieties of these three species. *E. ornatum* was the most abundant. According to Sakharov only 12 eggs are laid by each individual [R.A.E., A, ii, 357], whereas in the present observations this number was laid after each fertilisation, about 7 batches being laid in all, though it is possible that some had been laid before the bugs were captured. The eggs hatch in 6-10 days, and the larval stage lasts 30-40 days. Owing to the length of the egg-laying period it is possible to find freshly emerged adults and first stage larvae in July, both being the progeny of the same parent. The adults do not become sexually mature until the following spring, so that there can only be one generation a year [cf. loc. cit.]. During this period of development

they undergo various changes in colouration, which are described in detail. Parallel changes were found in *E. festivum*, the variations appearing identical in the two species; they are, however, considered to be distinct, as cross-breeding experiments were not successful.

[ORLOVA-NESTERCHUK (A. I.).] Орлова-Нестерчук (А. И.). **Preliminary Entomological Observations of the Experimental Agricultural Area of Khibinsk in August 1925.** [In Russian.]—*Défense des Plantes*, iii, no. 4-5, pp. 383-385. Leningrad, November 1926.

A short account is given of the soil, topography and vegetable crops of Khibinsk [Russian Lapland]. Considerable injury is caused to various cruciferous crops by *Hylemyia* sp. and *Plutella maculipennis*, Curt. The latter is particularly injurious to turnips, cabbages, kohlrabi and radishes, but is preyed upon by *Aleochara* sp. Onions were seriously injured by *Hylemyia antiqua*, Mg.

[VORONTZOV (A. T.).] Воронцов (А. Т.). **Injurious Forest Insects of the Government of Nizhni-Novgorod according to Observations made in 1924 and 1925.** [In Russian.]—*Défense des Plantes*, iii, no. 4-5, pp. 386-389. Leningrad, November 1926.

This list of 53 injurious insects includes brief notes as to their local distribution and importance.

[SOKANOVSKIĬ (B. V.).] Сокановский (Б. В.). **The Mole and its Significance in Forestry.** [In Russian.]—*Défense des Plantes*, iii, no. 4-5, pp. 390-392. Leningrad, November 1926.

A list is given of various insect pests found in the stomachs of moles in a forest area in Western Russia; they include mainly *Melolontha* and Elaterids.

[PARFENT'EV (I. A.).] Парфентьев (И. А.). **On the Question of Standardising Arsenical Insecticides.** [In Russian.]—*Défense des Plantes*, iii, no. 4-5, pp. 415-418. Leningrad, November 1926.

The chemical reactions of various arsenical insecticides are discussed, and the importance of knowing the arsenical content of proprietary brands is emphasised. Other factors to be considered in comparing the different insecticides are the physical properties and the size of the particles, the latter being particularly important where the chemicals are to be used as dusts. Notes on the toxicity of arsenical preparations in general use in Russia are given.

[BRYANTZEV (B.).] Брянцев (Б.). ***Cicadula* (*Jassus*) *sexnotata*, Fall., in White Russia.** [In Russian.]—*Défense des Plantes*, iii, no. 4-5, pp. 421-422. Leningrad, November 1926.

*Cicadula sexnotata*, Fall., occurred in injurious numbers in White Russia during the summer of 1925. The eggs are laid on oats and barley under the cuticle of the leaf. The greatest injury was caused to barley, the young plants becoming completely withered. The Jassids do not, however, show any particular preference for this plant, and they were equally abundant in meadow land.

[KHLEBNIKOVA (M.).] Хлебникова (М.). **The Wheat Cutworm, *Euxoa* (*Agrotis*) *tritici*, L., as a Pest of Cruciferous Plants in Western Siberia.** [In Russian.]—*Défense des Plantes*, iii, no. 4-5, pp. 423-424. Leningrad, November 1926.

*Euxoa tritici*, L., is recorded from the Government of Tomsk as causing injury to cabbage plants in June. Pupation occurred about 10-15th July.

[LINDEMAN (I. V.).] Линдеман (И. В.). **The Control of the Beet Weevil by means of Muscardine Fungi.** [In Russian.]—*Défense des Plantes*, iii, no. 4-5, pp. 404-414. Leningrad, November 1926.

This is a preliminary report of experiments on the control of the beet weevil [*Bothynoderes punctiventris*, Germ.] by means of the red and green Muscardine fungi (*Tarichium uvella* and *Penicillium anisopliae*) occurring in the soil of the government of Kiev. The synonymy of these fungi is discussed. The fungi used in the experiments were obtained from the soil at the edge of the beet fields. They were applied to the experimental plots in the autumn of 1924 in varying doses. The normal dose is that usually occurring in nature and is equal to 0.9 gms. of green muscardine powder (pounded mycelium with spores), and 4.5 gms. of red muscardine earth (dormant spores mixed with earth) to 49 sq. ft. In the spring, beet was sown on these plots, and adults of *B. punctiventris* were introduced. The soil became fairly heavily infested with the larvae of the weevil, from 22 to 35 being taken from an area of 49 sq. feet. In the autumn of 1925 a final examination of the soil was made. The percentage of infection of the larvae with *T. uvella* increased with the dosage applied, but did not surpass 48 per cent. The factors limiting the degree of an infection beyond this point are probably connected with cultivation or meteorological conditions. The maximum infection obtained with *P. anisopliae* was about the same as for the red fungus, but the dosage introduced into the soil does not apparently affect the percentage of infection, as the same results were obtained in the normally infected soil. This difference between the two fungi is probably due to the fact that *T. uvella* was introduced into the soil in the form of dormant spores, whereas *P. anisopliae* was introduced in the conidial stage; in this case the mycelium could develop saprophytically, so that in the following year there was an abundance of spores independent of the size of the original dose introduced; further, owing to the small size of the conidia of this fungus even small dosages are able to produce a maximum infection.

Crop rotation also affects the two fungi differently, thus *T. uvella* decreases in direct relation to the decrease of the amount of beet grown, but *P. anisopliae* increases as the other fungus decreases, the sum total of the two fungi remaining practically constant. The decrease of *T. uvella* resulting from crop rotation is probably due to the fact that a considerable number of the spores die owing to lack of weevil larvae as hosts; other larvae (*Anisoplia*, Elaterids, *Agrotis*) are seldom infected with *T. uvella* in the region under consideration.

The number of larvae of *B. punctiventris* occurring in a unit of area has absolutely no effect on the percentage infected by the fungi. The infection is not transmitted from one larva to another, but by direct contact with the soil containing living spores.

The work for 1926 is to include the practical application of natural reservoirs of the fungi situated at the edge of the beet fields. The author considers that a rate of infection of over 60 per cent. will never be obtained with either fungus used alone, but that if they are used in conjunction a rate of over 90 per cent. is possible.

[SAVZDARG (E.).] **Савздарг (Э.). The Cabbage Fly, *Phorbia brassicae*, Bch., on Stocks.** [In Russian.]—*Défense des Plantes*, iii, no. 4-5, pp. 419-420. Leningrad, November 1926.

At the beginning of June 1925 numbers of seedling stocks [*Matthiola*] were found to be dying as a result of infestation by *Phorbia brassicae*, Bch., from 3 to 25 larvae being found on one root. Plants in pots were watered with mercury bichloride, 1 : 1,000 and 1 : 1,200 ; this killed the eggs and young larvae, but had no effect on the older ones.

[ALPATOV (V. V.).] **Алпатов (В. В.). Variational Statistics as applied to the Systematic Position of the Asiatic Locust.** [In Russian.]—*Défense des Plantes*, iii, no. 4-5, pp. 352-359, 3 figs. Leningrad, November 1926.

This is a criticism of a paper by Makalovskaya on *Locusta migratoria* [R.A.E., A, xiv, 57]. Analysing biometric data given in that paper, the author comes to the conclusion that two clearly defined forms of *L. migratoria* were present in the material, thus supporting Uvarov's theory of the phases in this locust [R.A.E., A, ix, 561]. A scheme of measurements for biometric analysis is given.

[PLOTNIKOV (V. I.).] **Плотников (В. И.). *Locusta* (*Pachytylus*) *migratoria*, L., and *L. danica*, L., as independent Forms and their Derivatives.** [In Russian.]—Uzbekstansk. Opuitn. Stantz. zashchitui Rast. [Uzbekistan Exptl. Sta. Plant Prot.], 33 pp., 15 figs., 1 chart, 8 refs. Tashkent, 1927.

Observations during breeding experiments and in nature in Turkestan lead the author to the following conclusions: *Locusta migratoria*, L., and *L. danica*, L., must be regarded as independent forms (races) that are subject to strong individual variations as a result of the influence of external conditions. *L. migratoria*, when breeding in dense swarms exhibits well-known characters of colouration, morphology and behaviour ; breeding in isolation, or in dispersed swarms results in an individual variation in the direction of *L. danica*, but a complete transformation does not take place. In the same way, *L. danica* bred in crowded cages varies in the direction of *L. migratoria*, without attaining its typical characters. The two forms may form hybrids, which may be mistaken for transitional forms. The independence of the two forms is particularly indicated by the fact that *L. migratoria* always has one generation a year (though artificially the eggs may be induced to hatch without hibernation), while eggs of *L. danica* hatch soon after being laid (though in one case the eggs of this form hibernated as do those of *L. migratoria*).

Biometric studies make it possible to separate the two forms and the hybrids, though the characters overlap.

Thus it is possible to explain periodic variations in locusts without accepting Uvarov's theory of phases [R.A.E., A, ix, 561]. It is only the swarming races of locusts that undergo a periodic variation from a dispersed phase into a swarming one, and conversely.

[GERASIMENKO (L. R.).] Герасименко (Л. Р.). **The principal injurious Animals and Diseases of Plants in the Ukraine in 1926.** [In Ukrainian.]—*Prot. Plants in Ukraine*, ii, pp. 7-19. Kharkov, 1926. [Recd. February 1927.]

This monthly record of injurious animals and diseases occurring in the Ukraine, includes a number of insect pests.

[DEKHTYAREV (N. S.).] Дехтярьов (М. С.). **The Spread of *Tylenchus tritici*, Bast., in the Ukraine.** [In Ukrainian.]—*Prot. Plants in Ukraine*, ii, pp. 25-26, 1 fig. Kharkov, 1926. [Recd. February 1927.]

*Tylenchus tritici*, Bast., has only recently been known to occur in the Ukraine, where it infests wheat. A brief account is given of its life-history and control. The latter includes the disinfection of seed and crop rotation. Wheat should not be sown on infested fields at intervals of less than 3 years.

[DEKHTYAREV (N. S.).] Дехтярьов (М. С.). **On the Parasites of *Euxoa segetum*, Schiff., in 1925.** [In Ukrainian.]—*Prot. Plants in Ukraine*, ii, pp. 50-53, 4 figs., 5 refs. Kharkov, 1926. [Recd. February 1927.]

Notes are given on parasites of *Euxoa segetum*, Schiff., bred in June 1925 from larvae of the second generation of 1924 that had hibernated and in August from larvae of the first generation of 1925. *Gonia capitata*, DeG., and *Amblyteles radatorius*, Ill., were obtained in June; *Macrocentrus collaris*, Spin., in August; and *Meteorus rubens*, Nees, and *Cnephalia* sp. in both months.

[LEONTOVICH (B. P.).] Леонтович (Б. П.). **On the Injury caused by *Bruchus pisorum*, L., to different Varieties of Peas.** [In Russian.]—*Prot. Plants in Ukraine*, ii, pp. 53-62. Kharkov, 1926. [Recd. February 1927.]

Numbers of different varieties of peas have been tested at the Ekaterinoslav Experiment Station with a view to ascertaining their relative immunity from injury by *Bruchus pisorum*, L. The results were not satisfactory, as any apparent immunity of a given variety did not remain constant.

[KORAB (I. I.).] Кораб (И. И.). **The Influence of *Heterodera schachtii*, Schmidt, on different Kinds of Sugar-beet.** [In Russian.]—*Prot. Plants in Ukraine*, ii, pp. 64-70, 1 ref. Kharkov, 1926. [Recd. February 1927.]

Certain varieties of sugar-beet are more resistant to the attack of *Heterodera schachtii*, Schmidt, than others, suggesting the possibility of cultivating an immune variety. The cause of this resistance is to

be studied. The author points out that it is reasonable to suppose that the cultivation of an immune variety might be followed by the development of a race of the Nematode adapted to this variety.

[LYUBOMUDROV (I.). Любомудров (И.). **A New Pest of Winter Wheat in S.S.S.R., *Clinodiplosis equestris*, Wagn.** [In Russian.]—*Prot. Plants in Ukraine*, ii, pp. 76-77. Kharkov, 1926. [Recd. February 1927.]

*Clinodiplosis equestris*, Wagn., is recorded for the first time from Russia. The larvae occur under the leaf sheaths of wheat and produce swellings on the stems. As many as nine were found on one internode, and the threshing floor appeared quite red owing to the abundance of the dead larvae.

CANDURA (G. S.). **Contributo alla conoscenza della vera tignola del grano (*Sitotroga cerealella*, Oliv.).** [A Contribution to the Knowledge of the true Grain Moth, *S. cerealella*.]—*Boll. Lab. Zool. gen. agrar. R. Scuola sup. Agric.*, xix, pp. 19-102, 18 figs., 111 refs. Portici, 1926. [Recd. January 1927.]

Historical notes are given on *Sitotroga cerealella*, Oliv., with descriptions of all its stages, the details of its biology and control being based largely on original observations in Italy. The points discussed in detail include the life-history of the moth, its life in warehouses and in the field, the forms of injury noticed in storage, the effect of infestation on seed for sowing, and the methods to be followed in harvesting and storing such seed.

In storage many newly hatched larvae die, either because they are unable to penetrate dry, hard husks or because they have been killed by the mite, *Pediculoides ventricosus*, Newp. In southern Italy there are 5 generations a year. Hibernation was found to occur in the larval stage. The Chalcid, *Dibrachys boucheanus*, Ratz., is a primary parasite of the moth. At Portici it may have 6-7 generations a year on this host.

The temperature of grain warehouses must be kept as low and as constant as possible. In spite of its many disadvantages, carbon bisulphide is one of the best insecticides for practical use. If the sealing of the receptacle is effective, it is not necessary to use more than 40 cc. for 100 litres of grain [1 fl. oz. to 2.2 bushels].

MALENOTTI (E.). **L'esame zoologico del terreno destinato a frumento.** [The zoological Examination of Ground intended for Wheat.]—*Il Coltivatore*, 1926, no. 31, reprint, 7 pp. Casale Monferrato, 1926.

Soil examination when land is being ploughed for wheat enables measures to be taken against pests that could not be controlled after the wheat was sown. Notes are given on insects thus observed in the province of Brescia in September. *Melolontha melolontha* (*vulgaris*) is a serious pest when more than one larva occurs in 3-4 square yards; the larvae should be collected or exposed to poultry following the plough. An average infestation of 10 Elaterid larvae to 11 square feet represents a loss of 4 cwt. of grain an acre. Heavy applications (at least 350 lb. to the acre) of potash manures give good results. If

mole-cricket [Gryllotalpa] are abundant and not associated with other pests, the ground should be flooded and the insects destroyed along the edges where they take refuge; if earthworms or Melonothid larvae abound, the mole-cricket attack them in preference to the wheat. The ant, *Aphenogaster barbara*, may be injurious in dry, gravelly soil. Irrigation prior to sowing or sowing immediately after rain will enable the plants to germinate rapidly and thus escape attack.

MALENOTTI (E.). **Tignole dell' olivo.** [Olive Moths.]—*Pagine agricole*, 1926, Nos. 8-11, August–November, reprint, 7 pp., 2 figs. Leghorn, 1927.

The larvae of the Hyponomeutid, *Paradoxus osyridellus*, Stn., and the Pyralid, *Glyphodes unionalis*, Gn., attack olives in Tuscany, injuring the tender shoots, especially of grafted or severely pruned trees. The former is the more abundant; it was originally described from *Osyris alba*, which is common in marshlands. Its larva usually spins a cocoon within a curled leaf on the ground. *G. unionalis* has similar habits. In August its pupal period lasted 11 days, and in September 16. Pupae collected in August yielded larvae of the Tachinid, *Nemorilla floralis*, Fall. Spraying with lead arsenate should be effective, but both surfaces of a leaf must be sprayed, as the larvae feed indifferently on either surface and usually only on one. One application must be made on the first appearance of injury and a second 15 or 20 days later.

MALENOTTI (E.). **Un insetto che vieta la viticoltura.** [An Insect that prevents the Cultivation of Vines.]—*Giorn. Vinicolo ital.*, 1927, no. 1, reprint 12 pp., 1 fig. Casale Monferrato, 1927.

In certain districts of Verona, profitable vine-growing is impossible owing to the attacks of the adults of *Anomala vitis*. This beetle occurs throughout Italy, but in this region it is extraordinarily abundant. In June and July the beetles feed on numerous kinds of trees, a list of which is given. Having attacked a plant, they defoliate it entirely before passing to another. In experiments with various arsenicals and a heavy tar oil emulsion, lead arsenate alone was of any value, though it failed to afford complete protection, even at a strength of 7 per cent. powder, with 5 per cent. skim milk as an adhesive.

MERCET (R. G.). **Adiciones á la fauna española de Encirtidos (Hym. Chalc.). 6ª nota.**—*Eos*, ii, no. 4, pp. 309–320, 2 figs. Madrid, 30th December 1926.

The species recorded from Spain include: *Brocharis pascuorum*, Mayr, from *Eriopeltis lichtensteini*, Sign.; *Euaphycus ibericus*, Mercet, from *Aspidiotus (Hemiberlesia) trabuti*, Marchal; *E. botanicus*, Mercet, from *Diaspis visci*, Schr.; *E. brachypterus*, sp. n., from *Eriococcus buxi*, Boy.; *Metaphycus parvus* var. *eripeltii*, n., from *E. lichtensteini*; *Prionomitus mitratus*, Dalm., from *Psylla retamae*, Put.; and *Chiloneurinus microphagus*, Mayr, from *Aulacaspis rosae*, Bch. The author does not consider *Psyllaephagus* to be a synonym of *Prionomitus* [cf. R.A.E., A, xv, 106], and he gives the characters differentiating them.

UVAROV (B. P.). **New or less known Acrididae from Central Asia.**—*Eos*, ii, no. 4, pp. 321–359, 1 fig. Madrid, 30th December 1926.

Among the species dealt with *Chorthippus (Stauroderus) jacobsoni*, Ik., is recorded as damaging wheat fields in East Bokhara, together with *C. (S.) apricarius*, Fieb.

BOLÍVAR Y PIeltaín (C.). **Estudio monográfico del género *Polymoria* Först. (Hym. Chalc.).**—*Eos*, ii, no. 4, pp. 361–383, 5 figs., 7 refs. Madrid, 30th December 1926.

The species of the genus *Polymoria* are described with a key. They include *P. merceti*, sp. n., from *Scolytus (Eccoptogaster) multistriatus*, Mrsh., and *P. seyrigi*, sp. n., from the larvae of the Buprestid, *Acmaeodera adspersula*, Ill., both from Spain.

LAING (F.). **A New Name for *Dilachnus*, Baker (Aphididae).**—*Entomologist*, lix, no. 763, pp. 322–323. London, December 1926.

As the name *Dilachnus*, suggested by Baker for a section of the genus *Lachnus*, has already been used for a genus of Longicorn beetles, the author suggests that Baker's name should be replaced by *Panimerus*.

THEOBALD (F. V.). **A New Aphid Genus and two New Species.**—*Entomologist*, lx, no. 765, pp. 31–34. London, February 1927.

The species described are *Myzotoxoptera wimshurstae*, gen. et sp. n., from bitter cress (*Cardamine hirsuta*) in Kent; and *Periphyllus horridus*, sp. n., from sycamore in Somerset.

THEOBALD (F. V.). **Notes on British Aphids with Descriptions of two New Species.**—*Ent. Mo. Mag.*, lxiii, no. 753, pp. 30–34, 5 figs. London, February 1927.

The Aphids dealt with include *Saltusaphis ornatus*, sp. n., on oats, and *Aphis newtoni*, sp. n., on yellow iris (*Iris pseudacorus*) in Kent.

THEOBALD (F. V.). **Two New Aphids from Ants' Nests.**—*Ent. Record & Jl. Var.*, xxxix, no. 2, pp. 17–18, 1 pl. London, February 1927.

*Paracletus donisthorpei*, sp. n., from the nests of *Tapinoma nigerrima* and *Anuraphis siciliensis*, sp. n., from the nests of *Cremastogaster sordidula* are described from Sicily.

KIEBLER (—). **Beobachtungen über das Auftreten des Frostspanners im Herbst 1926. (Kt. Schaffhausen).** [Observations on the Occurrence of the Winter Moth in the Autumn of 1926 in the Canton of Schaffhausen.]—*Schweiz. Zeitschr. Obst- u. Weinbau*, xxxvi, no. 2, pp. 21–24. Wädenswil, 22nd January 1927.

The winter moth [*Cheimatobia brumata*] occurred in numbers in the autumn of 1925 in the Canton of Schaffhausen and did considerable harm to fruit trees, especially cherries, in the spring and summer of 1926. Banding was applied on a large scale. The occurrence of some larvae on banded trees may be explained by the fact that when the moths pair on a trunk and drop downwards, the male may be able to

fly up and carry the female over the banding. The bands should therefore be placed as low down as possible to prevent the male from starting the upward flight before the pair strikes the ground.

BAUNACKE (—). **Engerlingsschäden und ihre Abwehr.** [Injury by Melolonthid Larvae and its Prevention.]—*Die kranke Pflanze*, iv, no. 1, pp. 2-4. Dresden, January 1927.

A popular account is given of the bionomics of *Melolontha melolontha*, L., and *M. hippocastani*, F., in Saxony. The collection of the adults, which can be used as poultry-food or manure, is advised.

FERRIÈRE (C.). **Les parasites de quelques Cochenilles en Suisse.**—*Actes Soc. helvét. Sci. nat.*, cvii, no. 2, pp. 223-224. Aarau, 1926.

The following Chalcid parasites are recorded from Switzerland: *Coccophagus lunulatus*, How., *Aphycus punctipes*, Dalm., and *Aspidiotiphagus citrinus*, Craw. bred from *Aspidiotus hederæ*, Vall.; *Aphelinus mytilaspidis*, LeB., *Azotus pinifoliae*, Mercet, *Prospaltella aurantii*, How., *P. leucaspidis*, Mercet, *Anthemus pini*, sp. n., *Tetrastichus clavicornis*, Thoms., and *Centrobia walkeri*, Först., from *Leucaspis pini*, Htg.; *Encyrtus sylvis*, Dalm., *Pachyneuron coccorum*, L., and *Tetrastichus* sp., from *Lecanium coryli*, L.; and *Eusemion corniger*, Walk., *Aphycus punctipes*, *Pachyneuron coccorum*, *Coccophagus lunulatus*, and *Chiloneurus elegans*, Dalm., from *Pulvinaria vitis*, L.

ESCHERICH (K.). **Neuzeitliche Bekämpfung tierischer Schädlinge.** [Modern Work against Insect Pests.]—32 pp., 19 refs. Berlin, Julius Springer, 1927. Price Mk.1.80. (Reprinted from *Naturwissenschaften*, xiv, no. 48-49, pp. 1065-1074. Berlin, 26th November 1926.)

This is the full text of a lecture of which a report has already been noticed [*R.A.E.*, A, xiv, 602].

WEBER (H.). **Eine Blattfleckenkrankheit der Dahlie, verursacht durch *Aphelenchus ritzemabosi*, Schwartz.** [A Leaf-spot Disease of the Dahlia caused by *A. ritzemabosi*.]—*Forschungen Gebiet Pflanzenkr. u. Immunität im Pflanzenreich*, 3. Heft. Jena, 1927. (Abstract in *Nachrichtenbl. deutschen Pflanzenschutzdienst*, vii, no. 2, p. 18. Berlin, February 1927.)

The Nematode, *Aphelenchus ritzemabosi*, Schwartz, known to cause leaf-spots in chrysanthemums, can produce similar symptoms on dahlias. Preventive measures are the only ones feasible.

**Pflanzenschutzmittelverzeichnis des Deutschen Pflanzenschutzdienstes. Februar 1927.** [The German Plant Protection Service List of Chemicals for Plant Protection. February 1927.]—*Nachrichtenbl. deutschen Pflanzenschutzdienst*, vii, no. 2, pp. 19-24. Berlin, February 1927.

This is a list of the German proprietary preparations passed by the Plant Protection Service.

SACHTLEBEN (H.). **Das Auftreten der Forleule in den Jahren 1922 bis 1924.** [The Occurrence of the Pine Moth in Germany in the Years 1922 to 1924.]—*Mitt. Biol. Reichsanst. Land- u. Forstw.*, no. 30, pp. 376–383, 1 map. Berlin, 1927.

Outbreaks of the pine moth, *Panolis flammea* (*griseovariegata*) occurred in wide areas of northern and eastern Germany from 1922 to 1924. A detailed list is given of the various localities involved, with estimates of the damage caused.

KLEINE (R.). **Ueber die Immunität des Hafers gegen den Befall von Schadeinsekten.** [On the Resistance of Oats to Infestation by injurious Insects.]—*Fortschritte Landw.*, ii, no. 4, pp. 109–110. Vienna, 15th February 1927.

It is known that there are differences in the resistance of various varieties of oats to attack by the fruit-fly, *Oscinella* (*Oscinis*) *trit*, L. The author finds that groups arranged according to susceptibility or resistance comprise allied varieties, and that it is the "primitive" varieties that are the most resistant.

RAMBOUSEK (F.). **Ueber Rübenschädlinge im Jahre 1925.** [Beet Pests in 1925.]—*Zeitschr. Zuckerind. čsl. Repub.*, 1(vii), no. 43, pp. 357–360, no. 44, pp. 365–370; no. 45–46, pp. 373–378. Prague, 1926. (With a Summary in French.) [Recd. February 1927.]

Insect pests of sugar-beet were less injurious in Czechoslovakia in 1925 than had been anticipated owing to the cool spring, large numbers being killed by fungus infection. The pests are dealt with here in order of importance. The adults of a Cryptophagid beetle, *Atomaria linearis*, Steph., bite through the roots and underground part of the stem, either killing the seedlings or making them grow new side roots. They often occur with Elaterid larvae, and in many cases 80 per cent. of the injury ascribed to the wireworms is really due to them. *A. linearis* is increasing in Czechoslovakia and is adapting itself to beet. It is probable that larvae only occur in summer; in autumn enormous numbers of adults may be found among debris in fields and meadows. These hibernating individuals can be trapped in holes, 16 inches wide and deep, filled with beet stems and leaves. Owing to the difficulty of penetrating deep enough, chemical treatment of the soil is not feasible, but as a repellent, crude naphthaline will protect the plant until it has grown 4–6 normal leaves and is beyond the critical stage, 1 part by weight being mixed with 20 of beet seed.

The beet-fly, *Pegomyia hyoscyami* var. *betae*, Curt., is constantly increasing, though it is not yet so serious a pest as in Germany, where even the leaf-stalks and roots are attacked. The correct name of this fly is discussed. As it never oviposits except on beet, and the author's experiments confirm those of Cameron [*R.A.E.*, A, ii, 616], he considers it to be specifically distinct from *P. hyoscyami*, Panz. The fly is very resistant to cold and humidity, while such enemies as *Opius nitidulus*, Nees, are very susceptible to both. The hibernating generation of the fly is very slightly attacked by parasites, less than 2 per cent. being affected in some material. A disease, apparently of fungus origin, was responsible for the destruction of many larvae. As a result of laboratory experiments it is suggested that poison-baits, consisting

of bundles of wood shavings or straw dipped in water containing 20 per cent. glycerine, 0.5 per cent. white arsenic and some molasses, should be placed in the fields at intervals of about 10 yards. Heavy, evil-smelling smoke clouds drive away the adults seeking to oviposit, and the use of naphthaline with beet seed should also prove a satisfactory repellent. The maximum abundance of adults is in May, and measures against them should be applied at the end of May or early in June.

Elaterid larvae occurred everywhere, and in many localities the beets had to be ploughed under. Naphthaline proved very effective in repelling them. If wild carrots are grown in sunny places on grass-edges, the beetles collect there and may be captured from June to August. Minor pests of beet included the weevil, *Bothynoderes punctiventris*, Germ., which is decreasing owing to the use on a large scale of barium chloride; *Cassida nebulosa*, L., and *C. nobilis*, L., which also oviposit on *Atriplex* and *Chenopodium*; *Silpha obscura*, L.; *Lygus campestris*, L.; *Cicadula sexnotata*, Fall., which caused considerable injury in some places; *Euxoa* (*Agrotis*) *segetum*, Schiff., which was injurious in several districts, but is kept down by predacious beetles such as *Carabus cancellatus*, Ill., *C. arvensis*, F., *C. scheidleri*, Panz., and *Calosoma auropunctatum*, Hbst.; and *Arctia caja*, L., a new pest of beet, which was found on a few occasions.

OREST (M.). **Die in der Bukowina als schädlich und minderschädlich nachgewiesenen Borkenkäfer (Scolytidae).** [Bark-beetles, more or less harmful in Bukovina.]—*Verh. u. Mitt. siebenbürg. Ver. Naturwiss. Hermannstadt*, lxxv-lxxvi (1925-1926), pp. 57-67, 11 refs. Hermannstadt, 1926.

This is an annotated list of 50 bark-beetles from Bukovina.

OREST (M.). **Beiträge zur Biologie und geographischen Verbreitung zweier in Europa wenig bekannter Borkenkäfer.** [Contribution to the Biology and geographical Distribution of two little-known Bark-beetles in Europe.]—*Verh. u. Mitt. siebenbürg. Ver. Naturwiss. Hermannstadt*, lxxv-lxxvi (1925-1926), pp. 68-73, 1 fig., 1 ref. Hermannstadt, 1926.

*Ips spinidens*, Rtrr., the distribution of which in Europe is given, is a serious pest of fir [*Abies*]. Under normal conditions in Bukovina the females lay their eggs in the bark of the trees during April, and the larvae bore in the bark and sap-wood. By July the second generation is adult. The beetle prefers the upper part of the trunk, but it will also attack the lower part as far down as the root. Two or three weeks after a tree is attacked the needles become yellow. *Dryocoetes hectographus*, Rtrr., the distribution of which is also recorded, is found in the trunks of spruce trees lying on the ground.

TROUVELOT (B.). **Les récents progrès de l'entomologie appliquée à l'agriculture en Italie.**—*Bull. Soc. Encourag. Indust. Nat.*, October 1926, pp. 672-706, 9 refs. Paris, 1926. [Recd. February 1927.]

This report is the result of a visit to Italy in 1925. Biological and other measures against injurious insects are being intensified in that

country. One of the major problems is that presented by the olive fly, *Dacus oleae*, Gmel., which is estimated to cause the loss of 22 million gallons of olive oil annually, from 20 to 90 per cent. of the crop being lost. It is not possible at the present time to judge the effects of the natural enemies imported against this pest. Spraying with poison-baits has meanwhile given excellent results. Other work discussed includes the importation of natural enemies of Coccids, and of *Aphelinus mali*, Hald., against *Eriosoma lanigerum*, Hausm., and measures against the vine-moths [*Clysia ambiguella*, Hb., and *Polychrosis botrana*, Schiff.], which cannot be controlled by parasites in places where extensive areas are devoted to vine-growing, because the alternative hosts required by the parasites cannot find a sufficiency of their own food-plants.

HUBAULT (E.). **Une invasion de fidonie dans les pineraies de Haguenau. Epandage d'insecticides au moyen d'un avion.**—*La Nature*, no. 2753, pp. 77-80, 5 figs., 4 refs. Paris, 15th January 1927.

Another account of this experiment on the control of *Bupalus piniarius* by dusting from aeroplanes has already been noticed [*R.A.E.*, A, xv, 116].

FISHER (R. C.). **Recent Work in France on the parasitic Control of Insects.**—*Gard. Chron.*, lxxxi, no. 2089, pp. 34-36, 3 figs., 7 refs. London, 8th January 1927.

A brief account is given of the activities of the parasite laboratory established at Hyères in the south of France by the United States Bureau of Entomology for the export of beneficial insects to America, and also of the work done by the French Ministry of Agriculture in introducing natural enemies of Coccids into France.

Attempts to control *Eriosoma lanigerum* by the parasite, *Aphelinus mali*, have met with considerable success in the south of France and in Italy, but less satisfactory results have been obtained in the north, and near Paris, the indigenous Coccinellid, *Euxocheilus quadripustulatus*, is recorded as playing a much more important and useful part. Possibly more successful colonisation of the parasite in France might be obtained by selective breeding of a particular race suitable to the conditions prevailing in the district into which it is introduced.

For some time French workers have been studying the part played by parasites in relation to indigenous or long established pests that periodically cause severe loss. Similar work would be of considerable value in Britain, and the lines on which it might be undertaken are indicated.

PARKER (T.). **Emulsified Oils for the Destruction of Insect Eggs.**—*Gard. Chron.*, lxxxi, nos. 2090 & 2091, pp. 54, 72. London, 8th January 1927.

This paper amplifies and continues observations previously recorded [*R.A.E.*, A, xii, 194; xiii, 92].

The oils used in Europe for the destruction of Coccids and other hibernating insects and insect eggs vary in character, but those obtained

from the distillation of tar seem to be favoured, probably on account of plentiful supply and comparatively low cost of production. It has been shown that oils having a boiling point above 250° C. [530° F.], show a gradual diminution in insecticidal value with increase in boiling point, but this may be characteristic only of certain oils. Recent work has certainly indicated that oils for this class of work must be of a definite specification and that all fractions of tar distillates are not necessarily efficient as egg destroyers [cf. *R.A.E.*, A, xiv, 642]. Some insects' eggs are more resistant to oil emulsion sprays than others, particularly those of *Cheimatobia brumata*; this is possibly due to the difference in thickness of the chitinous covering of the egg.

Recent work in France and Germany has shown that the fraction obtained in the distillation of tar, known as green or anthracene oil, possesses very high ovicidal properties when used as an emulsion, but a drawback to this class of oil is that its composition varies according to the class of coal used in the making of the tar, and in consequence varied results have been recorded. Under laboratory conditions a 7.5 per cent. solution of emulsified cresylic acid has been found to kill 100 per cent. of the eggs of the silk-worm moth [*Bombyx mori*], but in the field the results have been most disappointing, owing either to the vapourisation of the thin film of oil, or to the washing off of the emulsion by rain soon after spraying. Tables are given to show comparisons of various types of tar and creosote in order to illustrate the wide variance in composition, which must of necessity greatly influence the value and action of any emulsion prepared from them, and a guide for the treatment of the more common insect pests and fungous diseases by means of spraying with standard tar-oil wash is included.

MILES (H. W.). **Thrips on Orchid Seedlings.**—*Gard. Chron.*, lxxxix, no. 2093, p. 96. London, 5th February 1927.

The species of thrips that infest glasshouses in Britain and Belgium include *Parthenothrips dracaenae*, Heeg., on palms and aspidistra, *Heliethrips haemorrhoidalis*, Bch., on palms and azaleas, *H. femoralis*, Reut., on orchids and *Thrips tabaci*, Lind., on a large variety of plants, including carnations. At the rate of  $\frac{1}{2}$  oz. to 1,000 cu. ft., calcium cyanide gives a fair control of the adult thrips, but does not destroy the immature stages. A series of fumigations is, therefore, necessary. The effect of this fumigant on seedling orchids has not been ascertained. Granular calcium cyanide as a soil fumigant, at the rate of 1 lb. to 12 cu. ft. of soil, will kill any hibernating thrips.

LE PELLEY (R. H.). **The White Fly, *Trialeurodes vaporariorum*, Westw.**—*Soc. guernesiaise Rept. & Trans.* 1925, pp. 491–492. Guernsey, 1926.

A brief account is given of the bionomics of *Trialeurodes vaporariorum*, Westw. [cf. *R.A.E.*, A, iii, 285, etc.]. In Guernsey this insect is found both in the open, where it does little damage, and in greenhouses, where it may cause considerable loss, its chief food-plants being tomato, cucumber and beans.

TEODORO (G.). *Coccidologica vii-viii*.—*Atti R. Ist. Veneto Sci. Let. ed Arti*, lxxxv, pt. 2, pp. 1157–1159, 5 refs. Venice, 1926.

The following scale-insects were collected by the author in the island of Rhodes : *Aspidiotus hederae*, Vall., on a number of different food-plants ; *A. britannicus*, Newst., on *Ligustrum* ; *A. ostreaeformis*, Curt., on horse-chestnut ; *A. rapax*, Comst. (*Hemiberlesia camelliae*, Leon.), on *Oleander* and mulberry ; *Leucaspis pini*, Hartig, on pine ; *L. riccae*, Targ., on olives ; *Lepidosaphes beckii*, Newm., on *Citrus* ; *Diaspis leperii*, Sign., on pear ; *Saissetia oleae*, Bern., on *Oleander* and olives ; and *Ceroplastes rusci*, L., on figs.

TILLYARD (R. J.). *The Principles of Biological Control in Economic Entomology*.—*Nature*, cxix, nos. 2988 & 2989, pp. 202–205 & 242–243. London, 5th & 12th February 1927.

The subject-matter of this paper is mainly the same as that of a more detailed account already noticed [*R.A.E.*, A, xiv, 421].

**Contributions to the Scientific Study of the Lac Industry. I-XI.**—*Jl. Ind. Inst. Sci.*, vii, nos. 7 & 15, pp. 97–144 & 285–297, 1 pl. ; ix A, no. 1, pp. 1–24, 10 pls. Bangalore, 1924 & 1926. (Notice in *Expt. Sta. Rec.*, lv, no. 7, pp. 661–662. Washington, D.C., November 1926.)

These papers deal with the subject as follows : (1) General Introduction [cf. *R.A.E.*, A, x, 171], by G. J. Fowler (pp. 97–103) ; (2) Problems in Lac Cultivation, by M. Sreenivasaya (pp. 104–113) ; (3) A Preliminary Note on Pot-Culture Experiments with *Cajanus indicus* as Host-plant, by M. Sreenivasaya, M. Venugopalan & C. R. Somayajulu (pp. 114–119) ; (4) Comparative Chemistry of the Host-plants of Lac (pp. 120–125), and (5) Rate of Secretion by the Lac Insect (pp. 126–128), by M. Sreenivasaya ; (6) The Application of Micro-methods to the Analysis of Lac Products, by C. R. Somayajulu (pp. 129–135) ; (7) Significance of Sex-differentiation among Lac Insects, by S. Mahdihassan (pp. 136–141) ; (8) Some Ether-soluble Constituents of Lac-resin, by D. N. Gupta (pp. 142–144) ; (9) The Influence of Meteorological Conditions on the Life-cycle of the Mysore Lac Insect, by M. Sreenivasaya & M. Basappa (pp. 285–291) ; (10) The Significance of the Constituents of some Stick-lacs, by C. R. Somayajulu (pp. 292–297) ; (11) Early Recognition of Sex among Lac Insects, by S. Mahdihassan (pp. 1–24).

HUSAIN (M. A.). *Report of the Imperial Entomologist*.—*Sci. Repts. Agric. Res. Inst. Pusa*, 1925–26, pp. 70–82. Calcutta, 1926. [Recd. February 1927.]

Examination of sugar-cane stubble at the time of harvesting and of the sets at the time of planting, showed that the stubble is the main source of infestation of the next crop by *Emmalocera depressella*, Swinh., and that the sets contain mainly *Diatraea* spp. and *Scirpophaga xanthogastrella*, Wlk. The safe disposal of stubble, the selection of uninfested sets, the destruction of alternative food-plants and the discouraging of ratoon cane crops are the control methods suggested. Cane seedlings were badly attacked by termites, and owing to the very temporary relief afforded by the usual methods of fumigating the soil

with carbon-bisulphide and irrigating with water containing crude oil emulsion, it was decided to experiment with poison baits. Of the various twigs tested for use as baits, jute was preferred; these were steeped in a mixture of 20 oz. lead arsenate, 4 lb. molasses and 40 gals. water and buried in a trench 2 ft. deep and 1 ft. wide dug all round the field. This measure shows possibilities of success. Aphids attacking lentils were controlled by the liberation of adults of the Coccinellid, *Chilomenes sexmaculata*, F.

Tests of various insecticides against the Jassids, *Idiocerus atkinsoni*, Leth., and *I. clypealis*, Leth., on mango showed that only calcium cyanide dusts "A" & "S" [R.A.E., A, xiv, 74, 555] were effective, the "A" dust giving excellent results.

*Diacrisia obliqua*, Wlk., severely attacked jute, *Phaseolus mungo* and *P. radiatus*, but was checked by hand-picking the egg-masses and young larvae.

Mustard plants, variously manured and drained, were subjected to the attack of Aphids to determine whether unhealthy plants show a definite predisposition for insects and produce substances that act as attractants, or whether they suffer because they are too weak to outgrow the attack. It was found that the plants that were healthiest and gave the highest yield were much more heavily attacked than the unhealthy ones, but are better able to withstand attack.

Experiments showed that the presence of a moist surface is necessary to induce oviposition in *Aulacophora abdominalis*, F., and *Dysdercus cingulatus*, F., and that atmospheric humidity is of no importance.

In discussing plant quarantine the author points out the necessity for employing at the ports men trained in entomology to report on intercepted pests and urges the study of those insects likely to be introduced.

During breeding experiments it was found that *Phthorimaea operculella*, Zell., passed through 13 generations from July 1925 to 30th May 1926.

MURATA (J.). **Gryllidae and the Methods of Control.** [In Japanese.]—*Agric. & Hortic.*, ii, no. 2, pp. 156-162. Tokyo, February 1927.

The cricket, *Acheta mitrata*, Burm., which is very common in Japan, feeds on a variety of vegetables, cucurbits being preferred. The adults appear in September and lay eggs in several masses in the soil in October. The eggs begin to hatch in the following June, and the adult stage is reached in 2½ months. A rat bait containing phosphorus mixed with melons is recommended for control.

TAKAHASHI (R.). **Aphididae of Formosa. Part 5.**—*Dept. Agric., Govt. Res. Inst., Formosa*, Rept. 22, 23 pp., 2 pls., 1 fig. Taihoku, February 1927.

The following new Aphids are described from Formosa: *Macrosiphum clematidis*, on *Clematis gouriana*; *M. rubiformosanum* and *Matsuniraja rubicola*, on *Rubus* sp.; *Anuraphis formosanus*, on *Blumea balsamifera*; *A. laniger*, on *Stauntonia hebandra*; *Drepanaphis sauteri*, on *Acer* sp.; *Myzocallis insularis*, on *Sapindus mukorossi*; and *Oregma heitoensis*, on *Bambusa* spp. and *Arundinaria* sp. The apterous viviparous females of *Lachnus niitakayamensis*, Tak. [R.A.E., A, xiii, 548], on *Elaeagnus oldhami* (not a conifer), and *Longistigma* (*Dilachnus*)

*liquidambarus*, Tak., on *Liquidambar formosana*, are described. *Nippolachnus piri*, Mats., on *Pyrus serotina*, its winter host-plant, *Eriobotrya japonica*, also being present, and *Tetraneura* sp., attacking the roots of sugar-cane (*Saccharum officinarum*), and causing serious damage in the eastern part of the island, are recorded for the first time from Formosa. A list of 14 species of Aphids collected in Botel Tobago, an island about 45 miles south-east from the southern extremity of Formosa, is given; there are very few cultivated plants on the island and the Aphid fauna is not rich, all the species found occurring also in Formosa. A third supplement to the food-plant catalogue of Formosan Aphids [R.A.E., A, xi, 441] and a correction to the description of the winged viviparous female of *Myzocallis querciformosanus*, Tak. [R.A.E., A, xii, 521] are appended.

GAHAN (A. B.). U.S. Bur. Ent. **Some Braconid and Chalcid Flies from Formosa, Parasitic on Aphids.**—*Proc. U.S. Nat. Mus.*, lxx, art. 8, no. 2657, 7 pp. Washington, D.C., 1926.

Some of the parasites recorded in this paper have been noticed elsewhere [R.A.E., A, xiii, 548]. The new Braconids described are: *Aphidius unilachni*, from *Unilachnus* [*orientalis*, Tak.], *A. laticeps*, from *Dilachnus* [*piniformosanus*, Tak.], *A. commodus*, from *Macrosiphum* (*Macrosiphoniella*) *formosartemisiae*, Tak., *Trioxys struma*, from *M. (M.) citricola*, v.d. G., and *Greenidea ficicola*, Tak., and *T. communis*, from *Aphis gossypii*, Glov. *Aphidius* sp. was reared from *Macrosiphum neoartemisiae*, Tak., and *Praon* sp. from *M. formosanum*, Tak.

FEY (K. Y.). **A General Review of Two Years' Work on the Control of the Paddy Borers in Chekiang Province.** [*In Chinese.*]—*Bur. Ent. Chekiang, Rept. 1924-25*, 15 pp., refs. Kashing, China, March 1926.

This report deals with the work carried out in 1924 and 1925 against the rice borers, *Chilo simplex*, Butl., and *Schoenobius incertellus*, Wlk., in Chekiang Province. During these years about 1,500,000 acres were infested with the borers. Collecting the egg-clusters and the adults were the measures chiefly practised.

FEY (K. Y.). **A Calendar for Control of Paddy Borers.** [*In Chinese.*]—*Bur. Ent. Chekiang, Pop. Bull.* 15, 1 sheet. Kashing, China, January 1926.

This is a revised edition of a previous bulletin [R.A.E., A, xiii, 226] showing the methods of control to be carried out month by month against *Chilo simplex*, Butl., and *Schoenobius incertellus*, Wlk.

FEY (K. Y.). **Guide to controlling the Paddy Borer.** [*In Chinese.*]—*Bur. Ent. Chekiang, Pop. Bull.* 16, 20 pp., 3 figs. Kashing, China, April 1926.

A brief summary is given of the various measures against the rice borers, *Chilo simplex*, Butl., and *Schoenobius incertellus*, Wlk. Collecting the egg clusters and the adults in summer, treating the rice straw in the spring and burning the stubble in winter are recommended.

MEEKING (E.). **Plant Enemies at our Gates.**—*Jl. Dept. Agric. Victoria*, xxiv, pt. 12, pp. 730-733. Melbourne, December 1926.

A brief popular account is given of the measures adopted in Australia, and in Victoria in particular, to guard against the introduction of plant pests and diseases. A list of the more serious ones that are as yet unknown in Australia is given.

ALLEN (W. J.) & BRERETON (W. LeG.). **Orchard Notes : Fruit Fly.**—*Agric. Gaz. N.S.W.*, xxxvii, pt. 11, p. 864. Sydney, 1st November 1926.

In an extensive field trial with a bait-spray for the control of the fruit-fly [*Ceratitis capitata*] a very appreciable reduction in the number of infested fruit as compared with an untreated plot was obtained. The spray recommended for trial, in addition to the regular collection and destruction of infested fruit, consists of the juice of 12 oranges or 18 peaches (defective fruit), 4 lb. molasses, 8 oz. lead arsenate paste (or 5 oz. powder), and water to make 4 gallons. This spray should be applied to the foliage in patches, at the rate of about 3-4 oz. to each tree, at intervals of 7 days, beginning 7-8 weeks before the fruit is ripe, and making at least 4 and preferably 6 applications; in applying the spray care should be taken to avoid the fruit, especially in the case of peaches. Further experiments with this spray will be carried out by the Department of Agriculture.

RAMSAY (A. A.). **"Cyaniding" Fruit Trees.**—*Agric. Gaz. N.S.W.*, xxxvii, pt. 12, pp. 927-928. Sydney, 1st December 1926.

As it has been suggested that the "pot" method of fumigation with hydrocyanic acid gas is a wasteful one, experiments have been carried out by the Department of Agriculture of New South Wales to determine exactly what losses occur in this process. In one series of experiments, the gas was evolved in a flask and was received in suitable absorption vessels, while in another the conditions were made to approximate as closely as possible to those of ordinary field practice. The cyanide used contained 40.36 per cent. hydrocyanic acid and 6.82 per cent. chlorine (present as an impurity). In eight tests, nearly all the hydrocyanic acid was given off, that left in the pot ranging from .05 to .02 per cent. of the whole. In field operations, leakages and losses may occur, but evidence leads to the conclusion that at least 95 to 98 per cent. of the hydrocyanic acid in the cyanide used would be available. In five cases, only 2.9 to 6.3 per cent. of the total chlorine present was evolved as hydrochloric acid (the average percentage being from 4 to 5) so that 95.5 per cent. of the total chlorine present in the sample remained unattacked. The probability is that the sulphuric acid reacts with the cyanide first, and that any remaining sulphuric acid then reacts with the sodium chloride, but the amount and concentration of the sulphuric acid is then so small that only a very small portion of the sodium chloride is decomposed. It is scarcely thought that the small amount of hydrochloric acid present would be injurious to foliage, but this point can only be determined by comparative trials in the field, with a relatively pure sodium cyanide as against the usual grade—that is, one containing cyanogen equivalent to 98 per cent. of potassium cyanide with a small amount of sodium chloride.

COCK (S. A.). **Fumigation of Citrus Trees.**—*Fruit World of Australasia*, xxvii, no. 12, pp. 578–579, 1 fig. Melbourne, 1st December 1926.

Fumigation of *Citrus* is now compulsory in Victoria, and is undertaken by the Department of Agriculture, if requested by the growers. The Department has several gangs of men operating 30 sheets each from December to the beginning of June, the work being performed at night and only when the weather is calm and the temperature is above 50° F. The sheets have measurements marked on them, indicating the number of cubic feet enclosed. In fumigating oranges, calcium cyanide dust, forced by a hose from a blower, is used, at the rate of 1 oz. to 100 cu. ft. During the summer of 1925–26 about 40,000 trees were fumigated by the Department. For lemons, liquid hydrocyanic acid gas is used, as calcium cyanide may cause foliage injury if there is any dew or rain within 24 hours of applying it. The principal pest against which fumigation is carried out is the red scale [*Chrysomphalus aurantii*, Mask.]; against the olive scale [*Saissetia oleae*, Bern.] it is effective from the beginning of March to the end of May, and fumigation during this period, when most of the larvae hatch, has in some cases eradicated this pest.

JARVIS (E.). **Cane Pest Combat and Control.**—*Queensland Agric. Jl.*, xxvi, pt. 6, pp. 478–481. Brisbane, 1st December 1926.

The effect of rainfall on the abundance of [*Lepidoderma*] *albohirtum*, Waterh. (grey-back cane beetle) in North Queensland from 1921 to 1925 is discussed [*cf. R.A.E.*, A, xv, 29]. An extensive outbreak of the beetle occurred in 1921, when the total annual rainfall at Meringa was 124.5 inches, being 34.5 inches above the average, but from 1922 to 1925 the annual rainfall was from 16 to 47 inches below the average, and no extensive outbreak occurred. A deficiency of rainfall from June to October provides a considerable check on the beetles, as lack of moisture in the soil affects the depth at which pupation takes place and the transformation from pupa to adult, but a deficiency in November and December provides a far more effective check, by preventing the emergence of many of the adults.

Notes are given on the butterflies that attack sugar-cane in North Queensland, the species so far recorded being *Melanitis leda banksia*, F., and the Hesperiid, *Parnara mathias*, F., *Telicota augias krefftii*, MacL., *Padraona hypomeloma*, Lower, and *P. marnas*, Feld. *M. leda banksia* is parasitised by a Tachinid and a Braconid, the former being the more numerous.

MUNGOMERY (R. W.). [**Report of the Southern Assistant Entomologist.**]—*Queensland Agric. Jl.*, xxvi, pt. 6, pp. 481–482. Brisbane, 1st December 1926.

Elaterid larvae (wireworms) and *Pentodon australis*, Blackb., cause considerable damage to newly-planted sugar-cane sets in some districts, attacking the eyes and underground parts of the shoots and producing "dead hearts." The wireworms bore small holes into the shoots and destroy the central tissues in a few days, each damaging several shoots. If the young cane is examined in the early morning before the heat of the sun causes a general flagging of the leaves, the first signs of injury can be seen and the wireworms will usually be found at

the base of the damaged sets. The adults of *P. australis* make larger irregular holes into the centre of the shoots, up to the ground level, and also attack the sets. Both wireworms and *P. australis* are often associated with *Paspalum*, and this grass should be kept down. Two common errors in cultivation tend to make the damage by these pests much more serious than it need be; in the first place ploughing is often too shallow, and sets are planted among clods of earth and clumps of *Paspalum*, and in the second place small thin sets are frequently used, which are unable to produce fresh eyes if the original ones are killed. On one farm where strong sets were planted the effect of wireworm damage was almost negligible, as all the damaged sets sent out new shoots.

ILLINGWORTH (J. F.). **Pineapple Insects and some related Pests.**—*Expt. Sta. Assoc. Hawaiian Pineapple Cannery, Bull. 9*, 64 pp., 44 figs., 179 refs. [Honolulu] November 1926.

The number of pests of any importance attacking pineapples is remarkably few, partly because this fruit has only lately been introduced on an extensive scale into field cultivation, and partly because the plant is so radically different from any other in cultivation that insects do not readily migrate to it from other crops. It has, however, been the experience in practically every tropical country in which pineapples have been extensively cultivated that an initial prosperity of the industry is followed by periods of loss or very small profits, owing to the accumulation of pests. In compiling the information contained in this paper, reference is made to 179 previous works, notes being given, and in some cases abstracts of the originals cited. The author gives a brief account of the pests and beneficial insects that have been recorded in pineapple fields, with notes on their distribution, the injury they cause, and the measures for their control.

CLEARE, jr. (L. D.). **On the Life-history of *Caligo illioneus illioneus*, Cram. (Lep., Morphidae).**—*Trans. Ent. Soc. London*, lxxiv, pt. 2, pp. 361-366, 3 pls. London, 21st December 1926.

An account is given of the life-history of *Caligo illioneus*, Cram., the larvae of which feed on the leaves of sugar-cane and bananas in British Guiana, though the butterfly never occurs in sufficient numbers to be more than a minor pest. The immature stages are described.

OGILVIE (L.). **Notes of Interest with regard to Plant Diseases and Pests.**—*Agric. Bull. Bermuda Dept. Agric.*, v, no. 7, pp. 6-7. Bermuda, July 1926. [Recd. February 1927.]

*Pseudococcus nipae*, Mask. (sugar-apple mealybug), which is a serious pest of sugar-apple [*Anona squamosa*], guava [*Psidium guajava*], avocado, palms and sapodilla [*Achras sapota*] in Bermuda, has apparently been exterminated in Hawaii by an Encyrtid, *Pseudaphycus utilis*, Timb., introduced from Mexico about 1922, and it is hoped to introduce this parasite from Mexico into Bermuda. Four generations of the Braconid, *Opius humilis*, Silv., a parasite of the Mediterranean fruit-fly [*Ceratitis capitata*, Wied.] imported from Hawaii in February 1926, have been reared in the laboratory, and numbers have been liberated. The Aphid, *Pentalonia nigronervosa*, Coq., which has been proved to

be the vector of bunchy top disease of bananas in Queensland [*R.A.E.*, A, xiv, 95], is common on bananas in Bermuda, but the disease does not occur in the island.

HARDY (F.) & URICH (F. W.). **Progress Reports.**—*Trinidad & Tobago: Min. & Proc. Frog hopper Invest. Comm.*, pt. v, pp. 102–103 & 108–111. Trinidad, 1926.

The situation with regard to the frog hopper [*Tomaspis saccharina*] in sugar-cane fields is recorded. Green muscardine fungus [*Metarhizium anisopliae*] and *Empusa* were found to have attacked a good many adults. On one estate, damaged canes occurred mainly on elevated areas, and it was evident that periodic flooding on the lower-lying areas had lessened the frog hopper incidence or minimised its effects. The theory that growing bamboos previous to the planting of sugar-cane adversely affected the soil conditions and induced susceptibility to frog hopper infestation was investigated and appeared to be untenable.

McKINSTRY (A. H.) & HARDY (F.). **A Preliminary Spraying Trial on Frog hopper Nymphs at Petit Morne Estate.**—*Trinidad & Tobago: Min. & Proc. Frog hopper Invest. Comm.*, pt. v, pp. 112–117. Trinidad, 1926.

In these tests several sprays were used against the sugar-cane frog hopper [*Tomaspis saccharina*] at a rate equivalent to about 850 gals. an acre, though it is thought that 500 gals. an acre would have been sufficient. Spraying was done from a 100-gal. barrel by means of a hand-pump, a concentrated jet being directed on to frog hopper spittle at the base of each stool, the object being to break the spittle mechanically in order to render the insecticides more effective, as it is known that oil emulsions, sprayed lightly over the nymphs in spittle, have little effect. All the liquids used reduced the intensity of infestation, the best results being obtained with a cresol emulsion containing 0.75 per cent. of a proprietary substance known as "Flit." This reduced the infestation by 74 per cent. in 3 days; carbon bisulphide-kerosene emulsion, containing 1 per cent. of active ingredients reduced it by 73 per cent., kerosene-cresol emulsion containing 0.75 per cent. kerosene by 60 per cent., and water alone by 58 per cent. All these were much slower in action than calcium cyanide powder [*cf. R.A.E.*, A, xv, 49], and were too expensive to compete with it if used in the amounts stated. A much cheaper, and probably equally effective emulsion might be prepared from 1 per cent. of crude fuel oil with a proprietary emulsifier, which is said to be cheaper and better than soft soap. Spraying requires large amounts of material, used with a high degree of force, and a plentiful supply of water, while the process is tedious and fatiguing and damage may be done to the canes by dragging the hose across the beds.

SMITH (E. B.). **Suggestions for the Control of Frog hoppers on Sugar-cane Estates.**—*Trinidad & Tobago: Min. & Proc. Frog hopper Invest. Comm.*, pt. v, pp. 118–123. Trinidad, 1926.

Observations indicate that the attacks of the frog hopper [*Tomaspis saccharina*] on sugar-cane begin in a few isolated spots and spread rapidly to adjoining lands as the insects migrate, the first generation

probably emerging from fields partly or completely destroyed by froghoppers during the previous year and allowed to lie fallow without tilling, from strips adjoining such fields and from any strips in which tall grass is allowed to grow. No instance has yet been noticed of blight caused by first-generation froghoppers arising from permanent pastures. Apparently the leaf-sap of ratoon canes, under the moist conditions of the beginning of the wet season, affords a food material conducive to oviposition, whereas plant-cane leaf-sap and fodder grass sap are less suitable. The first adult froghoppers apparently select the oldest available ratoon canes in preference to other canes near the origin of an attack. From late July to mid-September, however, immunity disappears, except in canes growing in practically flooded areas or in dry-season plant-caness. The favourite spots for oviposition are cane stools, especially old ratoon stumps, the under side of drain mould thrown over Para grass, and of coarse lumps of earth, especially of acid soil. Moderate moisture and the absence of cultural operations seem to be favourable to hatching of the eggs. The adults are gregarious and migrate in large numbers from field to field in search of food, ovipositing and injuring cane as they go. If the attack of the first generation has rendered the cane undesirable as food, the subsequent generations will abandon it and it may recover; moreover, on canes deprived of their foliage and exposed to sun and air, the moisture conditions are unfavourable to the nymphs.

The author suggests that control measures should be divided into three phases, the first to be undertaken not later than December and aiming at destroying the sources of possible attack. With this object, the incidence of spittle and adults in fields should be located by inspection and the nymphs destroyed in spittle with an insecticide such as calcium cyanide; all strips surrounding ratoon fields should be weeded and close cut in order to force the ovipositing adults into the fields where the eggs can subsequently be destroyed; and fields as well as strips should be cleared of grass so far as possible. During the dry season, the soil in each field and adjacent strips should be tested for the presence of eggs, by collecting stools and other materials known to harbour eggs and by soaking them in water to induce hatching. Where many eggs have been discovered, the fields should be thoroughly tilled in order to destroy the eggs by exposure to sun and wind, and the stools should be treated by shaving or any other practical method. All fields that are to be thrown out of cultivation or to be re-cultivated should be ploughed and harrowed. Fields should be planted during the dry season rather than the wet, as the plants are then more resistant to the blight. The third phase, to be undertaken as soon as first-generation froghoppers appear, includes the examination of each field for nymphs and adults and for streaky leaves, noting on which side of a field infestation is greatest and thus ascertaining the direction of migration; the destruction of nymphs with insecticides and of adults with light traps, etc., the artificial dissemination of green muscardine fungus [*Metarrhizium anisopliae*]; and the irrigation of fields by flooding the drains, beginning with fields where the attack is developing. Manures should not be applied to the surface of the soil, as this may induce development of surface roots and render the plants susceptible to drought and consequent froghopper blight. The soil texture should be improved by liming. Old infested cane fields should not be converted into temporary pasture, and definite fields of fodder crops should be established. Pasture grass only should be allowed in the strips round

the cane fields and should be kept close-cut, or, better still, leguminous plants only should be grown there. Cut grass should not be buried under sour mould from drains, but should be placed well in the cane beds before throwing up the mould. Cane beds should be reformed where necessary, to obtain even distribution of moisture throughout the fields that may be irrigated. Drains should be bevelled, and the beds should have slightly raised centres and level sides. Ratoons should not be cultivated beyond the third ratoon, and the more resistant varieties of cane should be chosen for planting and their growth forced in the early part of the growing season. Infested fields should not be weeded, as this drives the insects up into the cane foliage. Leguminous crops should be grown in fields that are lying fallow and along railway banks, so as to reduce the breeding-grounds of the froghopper. Bird sanctuaries should be established at intervals on the plantations.

FABIEN (E. E.) [&] FOLLETT-SMITH (R.). [Trials with Cyanogas on Sugar-cane.]—*Trinidad & Tobago: Min. & Proc. Froghopper Invest. Comm.*, pt. v, pp. 134–139. Trinidad, 1926.

Calcium cyanide dust, used on one estate against a migratory swarm of froghoppers [*Tomaspis saccharina*] on ratoon cane, was applied directly on to the leaves, but produced little or no lethal effect on the insects, the majority of them flying away. The leaves later showed signs of scorching from the dust and finally died. The same dust merely applied round stools showing nymph spittle killed the nymphs almost immediately, the treated fields later showing very little spittle as compared with untreated ones. The dust was applied from quart bottles fitted with corks into which quills or midribs of cane leaves had been inserted. The details of these treatments and their cost are recorded, the material being used at the rate of 1 lb. 10 oz. an acre.

Mr. F. Hardy points out, in a foot-note, that this amount of calcium cyanide is very small, and that in the more precise quantitative method employed by the Scientific Committee workers, some 30 lb. an acre was found necessary to effect 80 per cent. destruction of nymphs (as judged by the permanent disappearance of spittle-masses) [*R.A.E.*, A, xv, 50], but the above experience at least warrants the use of diluted calcium cyanide in future trials.

Tests were also made of the effect of various calcium cyanide dusts used alone or diluted with lime on the living green plant tissues. In no case were the canes killed, but the leaves above the point of application of the powders were in every case destroyed. The leaf-bases, however, continued to grow vigorously. The differences in effect of the powders on the leaves were not well marked, but the canes dusted with the mixture containing the largest amount of lime (2 parts to 1 of calcium cyanide) exhibited the greatest number of healthy green leaves at the end of the experiment. The growth of the canes was retarded by a fortnight; but no permanent injury seems to have resulted.

HOTTES (F. C.). **Two New Genera and a New Species of Aphidae.**—*Proc. Biol. Soc. Wash.*, xxxix, no. 25, pp. 115–120, 1 pl. Washington, D.C., 27th December 1926.

The three Aphids discussed were taken in Minnesota. *Bipersona*, gen. n., is erected for *Aphis torticauda*, Gillette, and *Alphitoaphis*,

gen. n., for *Aphis lonicericola*, Williams, which was found on *Lonicera dioica glaucescens*. *Carolinaia modestus*, sp. n., is described from a moss, *Polytrichum commune*.

CHAPIN (E. A.). **On some Coccinellidae of the Tribe Telsimini, with Descriptions of New Species.**—*Proc. Biol. Soc. Wash.*, xxxix, no. 29, pp. 129–134. Washington, D.C., 27th December 1926.

*Telsimia nitida*, sp. n., and *T. emarginata*, sp. n., are described, the former from the island of Guam, where it feeds extensively on *Aspidiotus destructor*, Sign. (coconut scale), and the latter from Foochow, China, whence it has been introduced into California as an enemy of Diaspine Coccids on *Citrus*.

REGAN (W. S.). **Oil Sprays vs. Lime-sulphur for the Control of Orchard Pests.**—*Proc. 31st Ann. Mtg. Idaho State Hort. Assoc.*, Jan. 20–22, 1926, pp. 49–57. Boise, Ida., 1926. [Recd. February 1927.]

The respective advantages of a standardised oil spray and ordinary commercial liquid lime-sulphur are discussed. Lime-sulphur is more effective against blister mite [*Eriophyes pyri*, Pgst.] but less effective against Aphids, red spider [*Tetranychus telarius*, L.] and leaf roller [*Tortrix argyrospila*, Wlk.]. If properly applied they are both equally effective against San José scale [*Aspidiotus perniciosus*, Comst.]. Lime-sulphur is less likely to injure trees, but oil is cheaper and more agreeable to handle and apply. It is suggested that the use of oil as a dormant spray alternated with lime-sulphur every second or third year, would give satisfactory results and make for greater economy. Information regarding the use of a new summer oil spray has already been noticed [*R.A.E.*, A, xiv, 264]. Reports from localities where oil sprays have been used yearly for a fifteen-year period indicate that no cumulative injury to the trees has occurred.

ANDERSON (H. W.). **The Effect of Sodium-fluoride Sprays on the Peach and on the Control of Bacterial Spot.**—*Science*, lxxv, no. 1671, pp. 16–18, 4 refs. New York, N.Y., 7th January 1927.

When peach trees were sprayed with a commercial sodium silico-fluoride, the fruit ripened 4–6 days earlier than on unsprayed plots, or on those sprayed with dry-mix lime-sulphur and had a higher colour, but was somewhat smaller. The taste was insipid and, in some cases, rather bitter. Cracking was somewhat more marked on the plots treated with sodium silicofluoride than on the others, but this might have been partly due to the difference in the time of ripening. A similar effect was recorded from peach trees sprayed with a commercial product containing barium fluoride.

While the effect of the fluoride on the leaves was found to vary, on the whole, little injury was observed, beyond some scorching at the tips and along the edge of the leaves in some cases. At the end of the season the trees were in as good condition as those sprayed with other materials.

BOYD (O. C.). **The Relative Efficiency of some Copper Dusts and Sprays in the Control of Potato Diseases and Insect Pests.**—*Cornell Univ. Agric. Expt. Sta.*, Bull. 451, 68 pp., 8 figs., 4 pp. refs. Ithaca, N. Y., July 1926. [Recd. February 1927.]

Experiments were undertaken in order to compare certain sprays and dusts, particularly Bordeaux mixture and dusts of copper sulphate and lime, in the control of potato diseases and insect pests. A comparison of the physical nature of the precipitate in Bordeaux mixture and copper-lime dust makes it reasonable to suppose that a more even distribution of the copper precipitate is possible with the spray than with the dust. More copper was retained by foliage sprayed with Bordeaux mixture than by the dusted foliage, and the percentage loss between applications was less than that from the dusted plants. When equal amounts of copper were applied with equally good apparatus, dusting on damp foliage and spraying gave equally good results against Aphids, while the spray coating was more effective against flea-beetles [*Epitrix cucumeris*], leaf-hoppers [*Empoasca fabae*] and tipburn. Both these fungicides gave better results against insects than sal-soda-Bordeaux or two proprietary Bordeaux dusts, one of which contained 15 per cent. lead arsenate. Copper-lime dust was more effective against insects when applied to damp rather than dry foliage, owing to the greater amount retained by the moist leaves and the rate of loss between applications was less. A casein spreader, "Kayso" (consisting of 1 part casein to 2 parts hydrated lime), produced no effect on the adhesiveness of either dust or spray, but considerably increased the spreading qualities of the latter. Sulphur used alone or mixed with hydrated lime gave only slight protection against flea-beetles, no injury to foliage or stunting of plants being observed. In some case a copper dust containing nicotine, when applied to damp foliage, proved superior to the same dust without nicotine in controlling Aphids. One dust, consisting of 6.5 per cent. monohydrated copper sulphate, 10 per cent. calcium arsenate, 1.9 per cent. nicotine sulphate and 81.6 per cent. hydrated lime, was more effective against Aphids than a sulphur dust containing 1.9 per cent. of nicotine. When freshly mixed copper-lime dusts containing 10 per cent. or more of copper were applied to wet foliage, the leaves were scorched. There was a strong indication, throughout the series of experiments, that heavy coatings of either dust or spray produced a stunting effect on the plants, quite apart from copper injury to the leaflets.

MOSES (B. D.), DURUZ (W. P.) & WOOD (T. A.). **Stationary Spray Plants in California.**—*California Agric. Expt. Sta.*, Bull. 406, 29 pp., 13 figs., 10 refs. Berkeley, Cal., October 1926. [Recd. February 1927.]

A stationary spray plant consists essentially of a power unit and pump of sufficient capacity to force spray liquids through underground pipes to all parts of an orchard; at convenient points, lengths of hose are attached to the pipes and the spray is applied to the trees in the usual way through spray rods or spray guns. The construction, laying out and operation of the plants are described, and the results of investigations on their working are given. The chief advantages of stationary

spray plants are that they enable spraying to be carried out at the proper time in spite of adverse conditions of soil and weather that might otherwise cause delay and with saving of labour, and thus quickly and cheaply. Other advantages include the lessening of danger of injury to trees and fruit and to cover crops, and the ease of spraying hillside orchards; the disadvantages include the initial high cost of installation and the loss of pressure in long pipes and hoses, necessitating high pump pressures.

FINK (D. E.). U.S. Bur. Ent. **Physiological Studies of the Effect of Arsenicals on the Respiratory Metabolism of Insects.**—*Jl. Agric. Res.*, xxxiii, no. 11, pp. 993-1007, 8 figs., 13 refs. Washington, D.C., 1st December 1926.

Experiments were made to determine the effect of various arsenical compounds and their component oxides and arsenic contents on the respiratory metabolism of adults of *Leptinotarsa decemlineata*, Say (potato beetle), some of the observations being confirmed by experiments on larvae of *Pheletes agonus*, Say (garden wireworm), and third stage larvae of *Popillia japonica*, Newm. (Japanese beetle). The evidence obtained points to the fact that arsenicals exert an inhibiting effect on the respiratory metabolism. The metabolic activity of potato beetles was reduced when they fed on lead arsenate, calcium arsenate, ferric arsenate and manganese arsenate for 2 to 16 hours, and increased when they fed on realgar (arsenic bisulphide) for the same period. The percentage depression of the oxygen consumption and carbon dioxide production varied with the arsenical employed. The effect of realgar was to stimulate activity at first, probably on account of its slight solubility and absorption by the protoplasm and its comparatively rapid rate of excretion, but after three days it caused a depression in the gaseous exchange.

The respiratory metabolism was reduced by feeding with lead oxide, manganese oxide, ferric oxide and calcium oxide, but the reduction with calcium oxide was insignificant. Sodium arsenite and sodium arsenate (which were only tested on larvae of *P. japonica*), arsenious acid and arsenic acid depressed the oxygen consumption and the carbon dioxide production profoundly during the first few hours after feeding; the reduction of the oxygen consumption then continued gradually until a maximum depression was reached for the concentration of the solution. This maximum of depression was used as a basis for comparing the relative toxicity of arsenious and arsenic acid and of sodium arsenite and sodium arsenate, and arsenious acid ( $As_2O_3$ ) was found to be 57 per cent. more toxic than arsenic acid ( $As_2O_5$ ), while sodium arsenite was 59 per cent. more toxic than sodium arsenate [cf. *R.A.E.*, A, xiv, 281].

With young insects the metabolic activity is much more marked than with older ones, and the influence of lead arsenate was more profound on young potato beetles than on old ones. This seems to indicate that the physiological activity of the living protoplasm is of prime importance in susceptibility to arsenical poisoning. On evidence of the inhibiting action of arsenicals on gaseous exchange, it would appear that their toxic action is essentially due to an interference in cellular oxidations and reductions.

ROBINSON (R. H.) & YATES (W. W.). **The Chemical Composition of Insecticides and Fungicides.**—*Oregon Agric. Expt. Sta.*, Circ. 64, 15 pp. Corvallis, Oregon, December 1925. [Recd. February 1927.]

The Oregon Economic Poison Act of 1923 was passed in order to prevent the sale of fraudulent materials and provides that all insecticides, fungicides and weed-killers shall be registered and a permit obtained for their sale, and that full particulars of each brand, including the name and percentage of the active ingredient, shall be attached to each package. A list of the manufacturers who have registered their products and been granted a permit for 1925 is given. The registration of any material of little or no value for the purpose for which it is intended to be used may be refused. Tables are given showing the guaranteed percentage of materials in various brands examined during 1925, and the percentage found by chemical analysis, together with notes on the chemical nature and stability of each material.

ROBINSON (R. H.). **Sprays, their Mixing and the Compatibility of Various Combinations.**—*Oregon Agric. Expt. Sta.*, Circ. 68, 11 pp. Corvallis, Oregon, February 1926. [Recd. February 1927.]

This circular contains recommendations for making various sprays so that the best results may be obtained and danger of foliage injury may be avoided. The method of procedure is especially important in making combination sprays, as in these reactions may occur that will reduce the toxicity of the materials used or release soluble compounds that will cause injury to fruit or foliage. The recommendations are based mainly upon laboratory studies of the chemical and physical reactions of the different combinations. Among the substances that can be used to retard chemical reactions in combined sprays the most practicable are skim milk and commercial casein spreader, the latter consisting of casein mixed dry with three parts hydrated lime. If skim milk is used for this purpose,  $\frac{1}{2}$  lb. hydrated lime should be added to 1 U.S. gal., and the milk should then be added to the spray at the rate of 2 qts. to 100 gals.; commercial casein spreader should be used at the rate of  $\frac{1}{2}$  lb. to 100 U.S. gals. When used as spreaders 3 U.S. qts. skim milk (containing hydrated lime) or  $\frac{3}{4}$  lb. commercial casein spreader should be added to 100 U.S. gals. of spray. Skim milk should be used if available, as its cost is less than half that of commercial casein spreader and it is just as effective, but many factors should be considered in deciding whether the expense of using these materials as spreaders is justified in any particular case.

FULTON (B. B.). **The Tree Crickets of Oregon.**—*Oregon Agric. Expt. Sta.*, Bull. 223, 20 pp., 8 figs., 7 refs. Corvallis, Oregon, June 1926. [Recd. February 1927.]

In Oregon there are three species of tree-crickets, *Oecanthus argentinus*, Sauss. (which the author regards as a race of *O. nigricornis*, Wlk.), *O. californicus*, Sauss., and *O. niveus*, DeG., which is the only destructive species in the State. The nature of the injury is described [R.A.E., ii, 673; xiv, 448]. A brief general life-history is given together with notes on the bionomics of each species, and a brief key to them, including the two races of *O. niveus* [R.A.E., A, xiii, 623]. A bait-spray con-

sisting of 5 U.S. gals. water, 1 U.S. qt. molasses and  $\frac{1}{4}$  lb. lead arsenate was found effective against tree-crickets severely attacking loganberries. All stages of *O. californicus* are described in detail.

GARDNER (L. R.). **Notes on Root-knot.**—*Jl. Ent. & Zool.*, xviii, no. 4, pp. 83-84. Claremont, Cal., December 1926.

Root-knot, resulting from infestation by the Nematode, *Heterodera radiculicola*, is commonly found in all parts of the United States, but is confined to greenhouses and protected gardens in the northern States. The author has compiled a list of over 100 food-plants of this Nematode.

CRUMB (S. E.). U.S. Bur. Ent. **The Bronzed Cutworm** (*Nephelodes emmedonia*, Cramer.) (Lepidoptera).—*Proc. Ent. Soc. Wash.*, xxviii, no. 9, pp. 201-207, 7 figs. Washington, D.C., December 1926.

The mature larva of the Noctuid, *Nephelodes emmedonia*, Cram. (bronzed cutworm) is fully described. Descriptions are also given of the egg, pupa and other larval instars, which have not apparently been described before. Eggs deposited in September and October do not hatch until January or February, and the young larvae frequently have to withstand very low temperatures and lack of food. The species has been reported as occurring throughout the United States east of the Rocky Mountains, but the author is inclined to consider it to be limited to the northern part of that region. The larva prefers grasses and cereals as food, but also eats the buds and leaves of fruit trees. There is only one generation a year. Larvae begin to reach maturity and enter the soil early in April, and few are found above ground after early May. Pupation begins in July, and adults first appear about mid-September and remain until mid-October. In the more southern regions of occurrence, development is more rapid, and therefore the period of retarded development, which occurs in every region, is longer. This retardation occurs in both the larval and egg stages, about 6 months of the year being spent in a quiescent state in northern Tennessee. As it is evident that there must be a limit to the period which the species can spend in a quiescent state, there may be a definite southern limit beyond which it cannot maintain itself owing to this fact.

FISHER (W. S.). U.S. Bur. Ent. **New Cactus Beetles.**—*Proc. Ent. Soc. Wash.*, xxviii, no. 9, pp. 214-217. Washington, D.C., December 1926.

*Moneilema* (M.) *nigriventris*, sp. n., *M. (Collapteryx) mexicanum*, sp. n., *M. (C.) punctipennis*, sp. n., and *Cactophagus spinolae* var. *rubronigrum*, n., are recorded from cactus, the first-named in Texas and the others in Mexico.

MUESEBECK (C. F. W.). U.S. Bur. Ent. **Descriptions of New Reared Parasitic Hymenoptera and some Notes on Synonymy.**—*Proc. U.S. Nat. Mus.*, lxi, art. 7, no. 2633, 18 pp. Washington, D.C., 1926.

The new species described include the Braconids, *Meteorus cingiliae*, a solitary parasite of the larvae of *Cingilia catenaria*, Drury, from Massachusetts and Rhode Island, and *Apanteles coxalis*, a gregarious parasite of the larva of *Acronycta oblinita*, S. & A., from Connecticut.

HOLLOWAY (T. E.) & HALEY (W. E.). U.S. Bur. Ent. **Factors influencing the Abundance of the Sugar Cane Moth Borer.**—*Facts about Sugar*, xxii, no. 2, pp. 42-43. New York, 8th January 1927.

There are so many factors influencing the infestation of sugar-cane by the moth borer, *Diatraea saccharalis crambidoides*, Grote, that in Louisiana it has been found almost impossible to conduct satisfactory control experiments except on large plantations of 1,000 acres or more. The most important of these factors is the infestation in seed cane. In Louisiana the cane is cut in autumn and planted, and in the spring part of the earth is scraped away and the remainder loosened to allow the sun to reach the planted stalks and so hasten germination. The emerging moths thus find only a little loose soil through which they have to force their way, and, having passed through it, they find young sugar-cane and maize plants ready for oviposition. Sugar-cane is generally planted in close proximity to maize, and oviposition occurs in spring on both maize and cane, but in the former there is more rapid development, so that many larvae can live in one maize stalk, compared with only two or three in sugar-cane. In summer, when the maize stalks dry up the moths emerge and fly to cane for oviposition. It is noticeable that on low lying parts of a plantation that are liable to occasional flooding, there is less emergence of borers, many having apparently been killed by submersion. Severe cold may destroy many borers in stubble and exposed pieces of cane, as in January 1924, when the lowest temperature reached was 17.5°F. The ploughing in of the stubble and rubbish left in the fields instead of burning it has given good results; though reduction of borer infestation cannot be guaranteed by this method, it does not destroy the egg-parasite, *Trichogramma minutum*, Riley, as burning does. Weather conditions appear to have considerable influence on infestation, borers being fewer after periods of heavy rainfall. The importance of clean cultivation as a means of reducing infestation is pointed out, and stubble should be cut as low as possible to avoid harbouring borers. The susceptibility of different varieties of cane to borer attack is discussed, as well as the treatment of seed cane by immersion in hot water [*R.A.E.*, A, xi, 254].

WALLACE (F. N.) & others. **Report of the Division of Entomology.**—*7th Ann. Rept. Indiana Dept. Conservation 1925*, reprint, 31 pp. Indianapolis, Ind., 1926. [Recd. February 1927.]

The insect pests that have occurred in Indiana in addition to those already noticed from recent reports [*R.A.E.*, A, xi, 309; xii, 345; xiii, 262] include *Thyridopteryx ephemeraeformis*, Haw., on evergreens and shade trees, and occasionally on fruit stock; *Datana ministra*, Drury (yellow-necked caterpillar), and *Eucosma (Tmetocera) ocellana*, Schiff. (bud moth) on apple nursery stock; *Tetranychus telarius*, L., damaging a great variety of plants; *Cydia (Carpocapsa) pomonella*, L. (codling moth); *Empoasca fabae*, Harr. (*mali*, LeB.), *E. maligna*, Walsh (*unicolor*, Gill.) and *Typhlocyba (Empoa) rosae*, L., which were common in orchards; *Conotrachelus nemophar*, Hbst. (plum curculio); *Cydia (Laspeyresia) molesta*, Busck (oriental peach moth), recorded for the first time at the end of 1924; *Pulvinaria vitis*, L. (cottony maple scale); and *Leptocoris trivittatus*, Say (box-elder plant bug).

*Tinea pellionella*, L. (case-making clothes moth) and *Tincola biselliella*, Humm. (webbing clothes moth) may be controlled by subjecting infested material to a temperature of 130°F. for not less than 24 hours or to a higher temperature for a shorter period. All stages of *Lasioderma serricorne* F. (cigarette beetle) are killed by a temperature of 140°F. maintained for several hours. The method of fumigation with carbon bisulphide for these three insects is described.

Satisfactory results were obtained in the control of the ants, *Solenopsis molesta*, Say, *Lasius niger americanus*, Emery, and *Prenolepis longicornis*, Latr., by dusting with sodium fluoride in places that the ants frequent, especially when this method was used in conjunction with the sweet poison bait already described [R.A.E., A, x, 312]. In cases where the ants prefer meat and greasy products to sweet substances, tartar emetic rubbed into the meat and fat adhering to a bone, 1 part of tartar emetic to 100 parts of lard, have also given good results.

In a discussion on termites and their control, the use of creosote as a repellent is suggested. Crude creosote may be used for soaking the ground around the source of infestation, especially where termites are coming through the mortar between bricks.

Grasshoppers were unusually abundant and damaged such crops as maize, beet and beans, and sometimes ate the bark off currant and gooseberry bushes and dwarf apple trees. The two most common species were *Melanoplus femur-rubrum*, DeG., and *M. differentialis*, Uhl. Flea-beetles (*Epitrix* spp. and *Systema* spp.) did considerable damage to such plants as tomatos and potatoes. The Sphingids, *Protoparce* (*Phlegethontius*) *quinquemaculata*, Haw., and *P. sexta*, Joh., caused serious defoliation of tomatos, but were controlled by the Braconid parasite, *Apanteles congregatus*, Say. The measures recommended against *Epilachna corrupta*, Muls. (Mexican bean beetle), which is spreading rapidly over the State, have already been noticed [R.A.E., A, xiii, 119, 262]. In one greenhouse, the chrysanthemum midge, here stated to be *Neocerata* (*Dasyneura*) *rhodophaga*, Coq. [cf. R.A.E., A, x, 311] was eradicated by cutting the chrysanthemum plants down to the surface of the soil or slightly below and keeping them somewhat dry until the roots had become active again. *Pseudococcus citri*, Risso, and *P. adonidum*, L., on greenhouse plants were controlled by spraying with nicotine oleate. In greenhouses where vegetables are grown the centipede, *Scutigera immaculata*, Newp., has been found infesting plants in what are known as ground benches. As these are often difficult to treat successfully the use of raised benches is recommended. Creosote acts as a good repellent if sprayed lightly on the soil when it is being dug; or the bench may be dressed lightly with sand soaked in creosote. Maize soaked in mercury bichloride solution (1 : 800) broadcast and raked into the soil just before planting time has been found effective as a bait in Oregon. The possibilities of calcium cyanide as a greenhouse fumigant are discussed. *Epicauta pennsylvanica*, DeG., which attacked aster flowers, can be controlled by nicotine oleate at the rate of 1 oz. to 1 U.S. gal. water. Calcium cyanide dust kills the adult beetles, but scorches the plants.

It appears probable that the bacterial spot of gladiolus leaves, *Bacterium gummisudans*, is transmitted by a leafhopper that is common on grass and is sometimes found sucking the sap of young gladiolus plants.

TISSOT (A. N.). **The Identity of the new Citrus Aphid.**—*Florida Ent.*, x, no. 4, pp. 56-57. Gainesville, Fla., January 1927.

In order to determine whether *Aphis spiraeicola*, Patch, is identical with *Aphis pomi*, DeG., several groups of Aphids were transferred from apple to young shoots of *Citrus*. Some of these Aphids produced a few young; these were transferred to other shoots of *Citrus* and two of them produced young that were again transferred to other shoots; some of these fed for a time but none reached maturity.

The fact that two individuals matured and produced young would seem to indicate that under favourable conditions a physiological race of Aphids might develop on apple or *Spiraea* that would be able to live and reproduce on *Citrus*.

PETERSON (A.) & HAEUSSLER (G. J.). **The Oriental Peach Moth.**—U.S. Dept. Agric., Dept. Circ. 395, 27 pp., 17 figs. Washington, D.C., October 1926. [Recd. February 1927.]

Most of the information on the bionomics of *Cydia* (*Laspeyresia*) *molesta*, Busck (Oriental peach moth) brought together in this circular has been noticed from other sources [*R.A.E.*, A, xiii, 384; xiv, 144, 441, 446; etc.]. The damage by the larvae is most serious to late peaches and quinces in the Middle Atlantic States, where there are four or five generations a year. In Georgia there may be seven generations, but the greater part of the peach crop is harvested by the middle of August, at about the time when the adults of the fourth generation are active, and in the districts where peaches are grown there is no other fruit available in sufficient quantity to provide food for the larvae of the subsequent generations, many of which must die; consequently comparatively few larvae hibernate. All stages of the moth are described and figured, and a table comparing the various phases of the life-history and the appearance of the stages with those of *C. (Carpocapsa) pomonella*, L. (codling moth) is given. The larva of *Anarsia lineatella*, Zell. (peach twig borer), a common native pest that is not yet serious in the Eastern States, which is often found in peach twigs, can be distinguished by its reddish-brown colour from that of *C. molesta*, which is whitish, becoming pink in the last instar.

Temperature greatly influences the activity and rate of development of the various stages of *C. molesta*, but all of them are very resistant to extremes, and no temperature conditions occurring in the regions where peaches are grown are apparently fatal. At an average temperature of 85° F. eggs hatch in 3½ days, but at temperatures near freezing they may take 43 days. Similarly, larvae may mature in 6 days when the day temperature is 95-100° F., while in cold weather in the autumn they may take 90 days; larvae may emerge from apples as late as January, even after the fruit has been frozen hard several times. The optimum temperature for egg-laying is 80-90° F.; temperatures above 100° F. or between 40° F. and 60° F. retard but do not entirely prevent egg-laying.

The various remedial measures that have been tested are discussed [*R.A.E.*, A, xiii, 252-254; xiv, 442, 446, 447]; none that is entirely satisfactory has yet been discovered. Control of the eggs by spraying is difficult because they are present in orchards from spring until September or October, while the incubation period is short, ranging from 3½ to 5 days in mid-summer, and in peach orchards 99 per cent.

are laid on the under side of the leaves. The destruction of the larvae by stomach or contact poisons before they enter the twigs or fruit does not at present appear practicable, and no satisfactory means of killing the larvae or pupae in the cocoons has been found. The moths are attracted to lights containing blue, violet or ultra-violet rays, but only in small numbers to electric lights giving a yellowish-white light, and it is unlikely that control can be effected by this means alone. The use of baits to attract the adults is still in the experimental stage. It seems probable that control will eventually be effected by parasites, of which 15 or more species are at present known to attack *C. molesta*; it has been found that when infestation occurs in new areas injury is most severe in the second and third years, after which the injury varies considerably, sometimes being negligible, and this seasonal variation is mainly due to parasites.

WILSON (R. J.). **Boll Weevil Control by Airplane.—Agriculture an Attractive Field for Commercial Aviation.**—*Cong. Rec.*, lxvii, no. 40, pp. 2887–2888. Washington, D.C., 1926. (Abstract in *Expt. Sta. Rec.*, lv, no. 3, p. 258. Washington, D.C., 1926.)

During 1924 a commercial corporation successfully dusted about 1,000 acres of cotton with calcium arsenate from aeroplanes for the control of the boll weevil [*Anthonomus grandis*, Boh.] in Mississippi. In 1925 the activities of the company were extended, and 50,000 acres of cotton, 200,000 peach trees, pecan groves and sugar-cane fields were dusted in several States, the work gaining the unqualified approval of 98 per cent. of the farmers concerned. The inclusive cost of dusting cotton was about 22 shillings an acre, three applications being made.

HERRICK (G. W.) & TANAKA (T.). **The Spruce Gall-Aphid (*Adelges abietis*, Kalténbach).**—*Cornell Univ. Agric. Expt. Sta.*, Bull. 454, 17 pp., 5 figs., 14 refs. Ithaca, N.Y., October 1926. [Reed. February 1927.]

A great deal of the information on *Chermes (Adelges) abietis*, Kalt. (spruce gall-aphis) contained in this bulletin has been previously noticed [*R.A.E.*, A, xii, 421]. The various forms are described. In the United States *Picea excelsa* and *P. canadensis* are the preferred food-plants, though *P. mariana*, *P. rubra* and hemlock (*Tsuga canadensis*) may also be attacked. Evidence indicates that oviposition is influenced by the development of the tree. Each female deposits from 150 to 200 or more eggs beneath her body, the oviposition period lasting 8–15 days from about 20th May. The eggs hatch after about a week, and by 5th June practically all have hatched. The young nymphs are active and crawl down behind the leaves of the buds, which are beginning to enlarge at their bases. The starting of the gall must be attributed to the female rather than to the nymphs, but the nymphs, settling in the partly-formed gall, apparently accelerate the modification of the leaves, and as the basal parts of many leaves become enlarged, a bulbous or gall-like enlargement of the whole growing branch is formed and the branch itself is checked in growth. If the Aphids are numerous enough to occupy spaces between all of the leaves, the gall is formed the whole way round the branch, while if they are few the enlargement may take place on one side only of the growing branch. The development of the nymphs takes place

in the galls, and in the fourth instar (pupa) the wing-pads are developed and are conspicuous. In August the pupae crawl out of the openings and settle on the leaves, and by 10th September the majority of the galls are open. The first eggs of the resulting winged females, which remain on the food-plant and are very inactive, were found on 22nd August, oviposition continuing in September. The eggs hatch in about a week, and by late October most of the nymphs have migrated to the twigs and settled there for the winter. The theories of various investigators regarding the life-history and biology of the species are discussed [*R.A.E.*, A, vi, 155]. Observations in the vicinity of Ithaca did not reveal any sexual forms of the Aphid, neither was there found to be any specific or varietal race or form that lives on larch, there developing a sexual cycle. Apparently oil emulsions, miscible oils and lime-sulphur are effective in control of *C. abietis*. Successful results have been obtained on a few trees at different times with lime-sulphur at winter strength (1 : 8), when the solution tested 32° Bé. The oils however may be preferred as they do not stain the foliage.

BACK (E. A.) & COTTON (R. T.). **The Cadelle.**—*U.S. Dept. Agric.*, Dept. Bull. 1428, 41 pp., 15 figs., 35 refs. Washington, D.C., October 1926. [Recd. January 1927.]

Notes on the synonymy and economic history of *Tenebroides mauritanicus*; L., are given. The larvae and adults feed on stored grain and grain products and are distributed all over the world wherever these are found. They bore through cardboard and wood and thus allow secondary pests to enter grain containers or packages of cereals. They also injure food-stuffs of a kind upon which they do not feed when seeking suitable places for pupation or hibernation, and for the same reason they bore into woodwork and the bolting cloth of flour mills, and have been known to form pupal cells by eating away nap in rolls of carpet. They may hibernate during the winter, and the larvae may live without food for a period of two years, so that a warehouse cleared of infested material and appearing to be thoroughly clean may yet be so infested that a new supply of grain products may be severely attacked.

The adults will attack and devour any larvae they encounter, including those of their own species. In summer they begin to oviposit about two weeks after emerging from the pupal cell; in the spring months the preoviposition period appears to be considerably longer, and in the case of adults emerging in late summer or early autumn no oviposition takes place until the following spring. Oviposition may cover a period of 2-14 months; females emerging during the summer months usually lay some of their eggs the same year, cease during the winter months, and begin again the following spring, continuing until exhaustion, which may not occur until October. The seasonal history and the duration of the various stages, which are described in detail, do not differ to any great extent from those already noticed [*R.A.E.*, A, xii, 93].

The adults are fairly resistant to starvation and survived for 52 days without food at an average mean temperature of 68° F., and for 184 days with a temperature ranging from 40-50° F. The larvae are very resistant; at room temperature one larva lived for 10 months, while others kept at a temperature between 40 and 50° F. were still alive

after 24 months of starvation, though they died shortly afterwards. The eggs and pupae were rather easily killed by low temperatures, and these stages are never found during the winter in the vicinity of Washington, D.C. The larvae and adults are, however, very resistant, and in granaries and storehouses are able to withstand very cold weather. Both survived exposure to a temperature of 15–20° F. for several weeks and will even withstand a temperature of 0° F. for several hours without apparent injury.

Cleanliness in the storehouse and granary is one of the most important factors in the control of this pest, and the substitution of concrete for wood, wherever possible, helps to prevent the infestation of fresh supplies. The methods of control of stored grain pests already noticed [*R.A.E.*, A, ix, 83; xiii, 51, 335; xiv, 470] are effective against *T. mauritanicus*.

SAVIN (M. B.). **Food Preferences of the Black Cricket (*Gryllus assimilis*) with Special Reference to the Damage done to Fabrics (Orthop.).**—*Ent. News*, xxxviii, nos. 1–2, pp. 4–10 & 33–39, 25 refs. Philadelphia, Pa., January & February 1927.

Experiments were undertaken to discover, if possible, why *Gryllus assimilis*, F., which is normally vegetarian, spasmodically attacks woollen and cotton goods. The crickets attacked almost anything offered to them including meat, mosquitos, flies, cloth, linen, silk, cotton, rubber, paper, etc. They undoubtedly preferred vegetable food, particularly when cooked, to woollen and cotton fabrics, and no reason for their attacking the latter was indicated, more especially as they attacked new cloth in the same manner as that spotted or stained. Rubber appeared to be peculiarly attractive and was even preferred to vegetables.

MILLER (A. E.). **A Case for the English Sparrow as an Insect Destroyer (Lepidoptera).**—*Ent. News*, xxxviii, no. 2, p. 58. Philadelphia, Pa., February 1927.

In Ohio from 1922–26 flocks of English sparrows were frequently observed feeding on the cabbage looper [*Phytometra brassicae*, Riley] and the imported cabbage worm [*Pieris rapae*, L.] in extensive cabbage patches, in spite of an abundance of grain and seeds. In two cases sparrows have also been known to attack large cecropia caterpillars [*Samia cecropia*, L.].

CHITTENDEN (F. H.). U.S. Bur. Ent. ***Tritoxa flexa*, Wied., the Black Onion Fly (Ortaliidae, Dipt.).**—*Canad. Ent.*, lix, no. 1, pp. 1–4, 1 fig., 8 refs. Orillia, Ont., January 1927.

The adult, larva and puparium of *Tritoxa flexa*, Wied. (black onion fly) are described and notes on its distribution in the United States are given.

ROSA (J. T.) & GARTHWAITE (E. L.). **Cantaloupe Production in California.**—*California Agric. Expt. Sta.*, Circ. 308, 48 pp., 29 figs., 5 refs. Berkeley, Cal., October 1926. [Recd. February 1927.]

This paper contains a brief account of the principal pests of cantaloupe melons in California, with recommendations for their control;

they include *Aphis gossypii*, Glov. (melon aphid), the cucumber beetles, *Diabrotica* spp., cutworms, red spider [*Tetranychus telarius*, L.] and Nematodes.

**Fruit and Vegetable Quarantine. Restrictions governing the Entry of Cipollini.**—*U.S. Dept. Agric., Fed. Hortic. Bd., S.R.A. no. 88*, p. 81. Washington, D.C., November 1926.

All shipments of cipollini [a kind of onion] imported into the United States, found infested with larvae of *Merodon equestris* or *Eumerus strigatus*, must be treated, at the importers' expense, for 2½ hours in water at a temperature of not less than 110° F., under conditions approved by an inspector of the Board.

**Quarantine on account of the Satin Moth. Notice of Quarantine no. 53, with Regulations, revised.**—*U.S. Dept. Agric., Fed. Hortic. Bd.*, 2 pp. Washington, D.C., 30th October 1926.

These regulations, superseding previous ones [*R.A.E.*, A, xiv, 123], revise the areas quarantined on account of *Stilpnotia salicis*, L., and add Connecticut to the list of quarantined States.

**Quarantine on account of the European Corn Borer. Notice of Quarantine no. 43 (4th Revision). Rules and Regulations supplemental to Notice of Quarantine no. 43 (4th Revision).**—*U.S. Dept. Agric., Fed. Hortic. Bd.*, 5 pp. Washington, D.C., 23rd November 1926.

This Notice of Quarantine, which came into force 23rd November 1926, amends the previous regulations [*R.A.E.*, A, xii, 577] to include new areas infested by *Pyrausta nubilalis*, Hb. Shelled corn and seed of broom corn are made liable to inspection and certification, and provision is made, as a condition of interstate movement, for the disinfection of any restricted article found infested.

**Quarantine on account of the European Corn Borer and other dangerous Insects and Plant Diseases. Notice of Quarantine no. 41 (2nd Revision). Revised Rules and Regulations supplemental to Notice of Quarantine no. 41 (2nd Revision) governing the Importation of Indian Corn or Maize, Broom Corn and related Plants.**—*U.S. Dept. Agric., Fed. Hortic. Bd.*, 3 pp. typescript. Washington, D.C., 16th December 1926.

The quarantine itself is unchanged, but the revised Rules and Regulations, which came into force 1st January 1927, amend previous ones [*R.A.E.*, A, xiv, 390]. The entry of products is limited to clean, shelled maize, clean seed of broom corn and broom corn for manufacture except as prohibited by Quarantine 24 and 42 dealing respectively with south-east Asia and Pacific Islands, and with Mexico. The shelled maize and seed of broom corn may only be imported under permit, are subject to inspection and must be accompanied by certificates from the country of origin of freedom from infestation by *Pyrausta nubilalis*, Hb. The restrictions on the entry of broom corn for manufacturing remain unchanged.

**Annual Letter of Information, no. 38.**—*U.S. Dept. Agric., Fed. Hortic. Bd., S.R.A., no. 85 (Suppmt.), 76 pp. Washington, D.C., October 1926.*

This is a list of pests intercepted on imported plants and plant products from 1st January 1924 to 31st December 1925.

MARLATT (C. L.). **Report [1925-26] of the Federal Horticultural Board.**—*U.S. Dept. Agric., Fed. Hortic. Bd., 27 pp., 1 map. Washington, D.C., 1926.*

This report deals with the administration of the Plant Quarantine Act for the year ending 30th June 1926 and reviews new and revised plant quarantines.

The status of the control of the pink bollworm [*Platyedra gossypiella*, Saund.] is summarised, and a map is given showing areas infested in Texas and New Mexico in 1925 [*R.A.E., A, xiv, 358*]. Efforts to eradicate the date scale [*Parlatoria blanchardi*, Targ.] showed satisfactory results, the chief difficulty being ornamental date palms in private gardens.

The problem of the thurberia weevil [*Anthonomus grandis thurberiae*, Pierce] is also discussed [*R.A.E., A, xiv, 654*]. It can maintain itself on cotton without the necessity of renewal each year from *Thurberia*, and can hibernate in the cotton with very little mortality.

ESSIG (E. O.). **Paradichlorobenzene as a Soil Fumigant.**—*California Agric. Expt. Sta., Bull. 411, 20 pp., 10 figs., 10 refs. Berkeley, Cal., October 1926. [Recd. February 1927.]*

As paradichlorobenzene has proved very successful as a soil fumigant against *Aegeria exitiosa*, Say (peach tree borer), tests have been made of its effects against other soil-infesting pests. The chemical and physical properties of the fumigant are discussed, and it is estimated that about 120,000 lb. of it were used in California in 1925. The methods of application are described. No attempt was made to remove the residue from around the trees, and as no ill-effects followed, it is recommended that the fumigant should be left until entirely evaporated or until farm practices require its removal, except in the case of nursery stock and young trees. For an average size ten-year-old prune, apricot or apple tree, from 1½ to 2 oz. is permissible, but a greater quantity might injure or kill the tree. For trees less than 6 years old, ¾ oz. is sufficient. For nursery trees, 1 oz. distributed along one yard of a single furrow two or three inches from the row gave satisfactory results, the residue being removed after 3 weeks. In severe infestations a furrow on each side of the row, 4 to 6 inches from the trees, may be used. As the fumigant cannot penetrate a moisture-laden soil, it is advisable to make the applications 2 or 3 weeks before irrigating rather than after. Whenever the soil temperature to a depth of 8 to 12 in. is over 75° F., treatments may be made if the soil is not actually wet, but, although these conditions prevail over a lengthy period in California, applications made in late August and September are generally the most effective. Against *A. opalescens*, Edw., on cherry (which is only occasionally attacked), prune and apricot, 1 oz. for average trees or 1½ to 2 oz. for larger ones are applied in a ring about 3 in. from the base of the tree. For nursery stock the fumigant is applied in a furrow

as described above. For the control of *Eriosoma lanuginosum*, Hartig (pear root aphid) from 1 to 1½ oz. is applied in a ring from 4 to 6 inches from the tree, the treatment being given for preference in June or July. The same dosage is required for *E. lanigerum*, Hausm. (woolly apple aphid) and can be applied in one or two concentric rings or in 6 to 8 furrows radiating from the base of the tree. Very satisfactory results have been obtained against this pest, though infestations far out on the roots are difficult to kill, but these are much less serious than those near the crown. Constant reinfestation from the tops of the trees by flying migrants make yearly treatments necessary. Paradichlorobenzene treatment should be combined with the application of oil sprays, the former being given in late summer and autumn, and the latter during the dormant winter period. Normally, one application of paradichlorobenzene in a year is sufficient, but from one to three may be made, provided that the soil temperature is at least 55° F. For *Pennisetia (Bembecia) marginata*, Harr., in raspberry and blackberry, ½ oz. for the smaller plants and ¾ oz. for the larger ones is applied in a ring. The result obtained in California is different from that in New Jersey, where from ½ to 2 oz. applied to blackberries and left for 3 weeks killed the bushes. Limited experiments have been made with regard to *Phylloxera vitifoliae*, Fitch, but no specific recommendations can as yet be given for the use of paradichlorobenzene on grape-vines. Dahlia tubers very badly infested with wireworms were treated by placing about a teaspoonful of paradichlorobenzene some 2 inches above each planted tuber, with the result that the plants at once revived and gave an excellent crop of flowers. The chemical probably acted chiefly as a repellent, but no wireworms were found after the treatment on any of the several hundred tubers treated. Paradichlorobenzene used as a fumigant against the garden centipede, *Scutigera immaculata*, Newp. [*R.A.E.*, A, xii, 578] proved unsatisfactory on the whole, probably owing to the porous soil in which the tests were made.

A brief note on the use of this fumigant against pests of stored products is also given.

ANDREW (R. E.) & GARMAN (P.). **A Chemical Investigation of some Standard Spray Mixtures.**—*Connecticut Agric. Expt. Sta.*, Bull. 278, pp. 491–508, 28 refs. New Haven, Conn., May 1926. [Recd. February 1927.]

A brief account of the investigations described in this bulletin has already been noticed [*R.A.E.*, A, xiv, 542]. The work of other authors on the chemical reactions that take place when lead arsenate and lime-sulphur are combined, with or without the addition of other materials, is briefly reviewed, and the experimental methods employed are described. Using the same amount of each ingredient throughout the experiments, *viz.* 2.4 gms. acid lead arsenate, 0.6 cc. nicotine sulphate, 0.55 gms. casein-lime, 14.5 cc. lime-sulphur and distilled water to make 500 cc., mixtures were made with all the possible combinations of these materials taken 2, 3 and 4 at a time, in all the possible orders of mixing. Each mixture was agitated for an hour and then filtered; its physical characteristics were recorded, and the total sulphur in the filtrate and the total water-soluble arsenic (as arsenic pentoxide) in the filtrate and the insoluble residue were determined. The results of these determinations are given in a series of tables.

Lime-sulphur reacts strongly with lead arsenate or lead arsenate in combination with nicotine sulphate, giving a greatly increased amount of soluble arsenic and decreased sulphur in solution. The addition of nicotine sulphate to lead arsenate or lime-sulphur produces a colour change, but does not affect the amount of soluble arsenic or sulphur; the addition of nicotine sulphate to lead arsenate and casein-lime gives an increase in the soluble arsenic, but when it is added to lead arsenate and lime-sulphur in combination, there is a decrease in the soluble arsenic and soluble sulphur. Casein-lime increases the soluble arsenic when added to lead arsenate, and reduces the soluble sulphur when added to lime-sulphur; when added to lead arsenate and lime-sulphur in combination, it increases the soluble sulphur and greatly reduces the soluble arsenic; when added to nicotine sulphate and lead arsenate in combination, it increases the soluble arsenic, but when added to lime-sulphur and nicotine sulphate in combination, it has little effect. In quadruple mixtures the addition of casein-lime generally increases the soluble sulphur and reduces the soluble arsenic, but it sometimes increases the latter. When lime (0.3 or 0.6 gms.) is substituted for casein-lime in the quadruple mixtures, it reduces the amount of soluble arsenic as much or more, and does not greatly reduce the amount of soluble sulphur. The variations produced by altering the order in making the quadruple mixtures are so small that the selection of improved mixtures does not seem possible. In all cases the greater part of the soluble arsenic is found in the residue, which emphasises the necessity for cleaning the spray tank frequently.

WELLS (W. G.). **Queensland: Report of the Work of the Callide Cotton Research Station, Biloela, for the Year ending June 30, 1926.**—*Empire Cotton Growing Corp.*, Repts. Expt. Stas., 1925-26, pp. 5-18, 1 pl., 1 map. London, 1927.

Much of the information contained in this report has been previously noticed [*R.A.E.*, A, xiv, 386, 589]. With the exception of *Heliothis obsoleta*, Hb., few insect pests are recorded, as the severe heat and drought that occurred during January and February 1926, reduced the numbers of *Dysdercus* [*sidae*, Montr.], *Tectocoris lineola*, F., and *Oxycaenus* [*luctuosus*, Montr.], although with the advent of cooler weather and showers their numbers increased to more normal proportions. The cotton crop was cut when green, before all the top crop of late bolls had matured, and stacked for burning in order to trap *Dysdercus*, which, with *T. lineola*, is closely associated with the occurrence of internal boll rots [*R.A.E.*, A, xiv, 223]. This method also reduces the numbers of *Platyedra gossypiella*, Saund. (pink bollworm), *Dichocrocis* (*Conogethes*) *punctiferalis*, Gn. (peach grub), and *Earias huegeli*, Rogenh. (rough bollworm).

PARNELL (F. R.). **South Africa: Cotton-breeding Station, Barberton—Report for Season 1925-26.**—*Empire Cotton Growing Corp.*, Repts. Expt. Stas., 1925-26, pp. 24-45, 4 pls. London, 1927.

Experimental work on the selection of Jassid-resistant varieties of cotton was continued [*R.A.E.*, A, xiii, 527], and a detailed account is given of the injury caused by *Empoasca facialis*, Jac., together with

notes on its life-history, which is similar to that in the French Sudan [*R.A.E.*, A, xiii, 75] except that the life-cycle takes a few days longer. Brief descriptions of the various stages are given.

Experiments carried out to determine whether *E. facialis* was the real cause of the damage ascribed to it showed that it is directly concerned, and the fact that the plants recover to a great extent after fumigation indicates the great improbability of the Jassid being merely the carrier of some organic disease that does the real damage. Moreover, the injury only occurs in the immediate neighbourhood of the actual spot punctured in feeding. A few nymphs can produce such rapid damage that the actual withdrawal of the cell sap cannot well be the main factor, and it seems more likely that some toxic secretion is injected. The adult Jassid appears to produce very much less effect than the nymph, but the larger the nymphs the greater the injury.

When dealing with a given variety of cotton any factor that decreases the vigour of growth, such as drought or water-logging, appears to increase susceptibility. From observations it appears doubtful whether in the area under review the prevalence of the Jassid is connected to any appreciable extent with plant food deficiency.

As between different strains of cotton, vigour of growth and lateness of planting, although of importance, are not deciding factors in resistance, which is probably due to various combinations of numerous factors. Chemical and physical attributes of the plant may affect attraction, feeding and breeding of the Jassid, thus influencing the severity of the attack, and different degrees of tolerance for the pest may affect the resultant damage to the plant. Hairiness is connected with resistance, and experiments showed that the length of the hairs is of more importance than their density. The actual connection between hairiness and resistance may be due to the correlation between hairiness and some factor affecting the Jassid, but a purely mechanical explanation seems reasonable, as the nymphs have difficulty in moving on the hairy leaves, and the adults probably avoid them.

PARSONS (F. S.). **South Africa: Cotton Experiment Station, Can-dover Estates, Magut, Natal—Report for the Season 1925-26.**—*Empire Cotton Growing Corp.*, Repts. Expt. Stas., 1925-26, pp. 46-62, 5 refs. London, 1927.

From September to July only occasional larvae of *Heliothis* (*Chloridea*) *obsoleta*, F. (American bollworm) were found. The author is of the opinion that *Earias insulana*, Boisd. (spiny bollworm) causes more damage than is generally recognised, and the abundance of its wild food-plants, of which a preliminary list is appended, would maintain its presence in the face of successful measures against *Diparopsis castanea*, Hmps. (Sudan bollworm). Larvae and eggs indistinguishable from those of *D. castanea* have been commonly found on a malvaceous plant (probably of the genus *Fugosia*), and a moth exactly like that of *D. castanea* has been found resting on this plant as well as on *Hibiscus esculentus* and *Fugosia gerrardi*. An attack of *D. castanea* occurred on a crop in an isolated tract of newly broken soil separated by 7 or 8 miles of heavy bush, including a range of hills, from old cotton lands. Occasional bushes of wild cotton (of which the local variety appears to be *Gossypium obtusifolium* var. *africanum*) found in the surrounding scrub were infested and were presumably the source of the infestation,

demonstrating clearly the importance of wild food-plants. Around the older cotton lands wild cotton is gradually being destroyed. Boll-worms do not entirely disappear during the winter months, and the three species mentioned were found in relative abundance up to the end of June; they were less easy to find in July and rare in August, *H. obsoleta* not being found after June. Undoubtedly the greater number of mature larvae hibernated during the winter, and the first spring flight of moths occurred during the last week of August. The larvae of *E. insulana* and *D. castanea* were then in the ratio of 5:1, and judging from their relative sizes the former had hatched at least a week earlier. Of the pupae of *D. castanea* in observation cages 37 per cent. were parasitised or damaged in some way.

In certain fields 60 per cent. of the seedling cotton has been destroyed by the adults of the Eumolpid, *Syagrus rugifrons*, Baly [*R.A.E.*, A, xiii, 113], while attacks by the larvae, which occurred on the roots of young and old plants, generally proved fatal. In February infested rows of late germinating seedlings were dusted with commercial mixtures of Urania green, calcium arsenate, acid lead arsenate, potassium silicofluoride and nicotine, and sprayed with a combination of lead arsenate and Bordeaux mixture. The particles of potassium silicofluoride appeared to be too coarse, tended to go into lumps in the blower and did not suspend well on the leaves. Nicotine dust was of no value, while the spray was not very effective; but the other insecticides all appeared to produce 100 per cent. mortality. An independent test of Paris green dust was reported to be a complete success, but a light shower falling on the following day caused severe foliage injury. The adult and larva of *S. rugifrons* are briefly described. The mature larva forms an earthen cell from which the adult emerges about 3 weeks later. The beetle does not damage the older cotton plants to any extent, but has been found eating out shallow circular patches on the wall of the bolls. It seems probable that it passes the winter in the adult stage; it is found in newly ploughed lands in July and August. Dusting with calcium arsenate is suggested as soon as it appears on the seedling cotton. It feeds to a limited extent on *Abutilon soneratianum*, on which *Tetranychus* sp. (cotton red spider) also breeds, though it was only a pest of minor importance in the season under review.

Little damage was done by the Jassid, *Empoasca (Chlorita) facialis*, Jac., except on a block of cotton growing on light sandy soil, where investigation showed that the scattered groups of comparatively healthy plants were growing on old ant heaps, or where a large tree had been cut down. *Oxycarenus* sp. appeared in enormous numbers in February, and remained during picking, while *Nezara viridula*, L., was commonly found from March onwards. The field cricket, *Gryllus assimilis*, F., did considerable damage, although if the seed bed was properly prepared and moisture was available, the seedlings came up quickly and were able to resist attack. Wireworms and cutworms were also injurious.

WOOD (R. C.). **Report on Experimental Work on Cotton in Swaziland—Season 1925-26.**—*Empire Cotton Growing Corp.*, Repts. Expt. Stas., 1925-26, pp. 64-87, 1 chart. London, 1927.

*Laphygma exigua*, Hb., appeared on 2nd January on cotton seedlings twelve days old and on 4th January was found to be infesting every seedling over an area of about an acre. Tapping the seedling caused

the caterpillars to fall to the ground, and they were then hand-picked. The plots were dusted with a mixture of ashes and arsenic, and a bait made of chopped weeds (on which the caterpillars had been found feeding) sprinkled with locust poison was broadcasted, and on 11th January it was difficult to find a single individual.

Of the three bollworms, the spiny bollworm [*Earias insulana*, Boisd.] was of slight importance, and though the American bollworm [*Heliothis obsoleta*, F.] caused some serious injury, the red bollworm [*Diparopsis castanea*, Hmps.] seemed to be responsible for most of the damage that was done. Bolls were collected for observation on 15th and 30th June, but no moths of *D. castanea* had emerged from these up to the end of September, so that a close period during the winter months may not be completely successful in dealing with this pest. Some emergence does take place, however, under natural conditions as half-grown caterpillars were found in September. The Jassid [*Empoasca facialis*, Jac.] occurred too late to damage early sown crops, but it undoubtedly lowered the yield of the late plots. Plants that had lost their leading shoot (probably through the attack of *L. exigua*) and had thus bifurcated into two equal stems, seemed to be more resistant to the attack of this pest, probably owing to the fact that they developed later than the normal plants and were still growing. Aphid attacks, which were intermittent, cause the whole leaf to crinkle whereas Jassid injury causes the edges to turn down. *Dysdercus* sp. and *Oxycarenus* sp. caused considerable damage. A fruit beetle (*Pachnoda* sp.) was observed on one or two occasions attacking green bolls, while red spider [*Tetranychus* sp.] has also been noticed on cotton.

HAMILTON (I. G.) & PEAT (J. E.). **Southern Rhodesia: Cotton-breeding Station, Gatooma: Report 1925-26.**—*Empire Cotton Growing Corp.*, Repts. Expt. Stas., 1925-26, pp. 89-104, 1 pl., 4 figs. London, 1927.

The Jassid [*Empoasca facialis*, Jac.] affected the whole area, though some varieties of cotton were resistant. From the patchy effect of the injury it seems that soil conditions exert some slight control on the effect of Jassid attack. The American bollworm [*Heliothis obsoleta*, F.] was a serious pest locally; the spiny bollworm [*Earias insulana*, Boisd.] did some slight damage; but the Sudan bollworm [*Diparopsis castanea*, Hmps.] did not appear to be present. Aphids caused local damage, while termites killed numerous plants by eating through the stems at about ground level. Stainers [*Dysdercus*] appeared early, but were not abundant until after the bolls had opened about the beginning of May.

DUCKER (H. C.). **Report on the Work of the Cotton Experiment Stations, Nyasaland, for the Year ending October, 1926.**—*Empire Cotton Growing Corp.*, Repts. Expt. Stas., pp. 178-200, 3 pls. London, 1927.

Insect pests, which had been numerous and caused much damage, began to decrease in July and by the middle of September had almost disappeared. All species of bollworm were practically absent and stainers (*Dysdercus*) were only present in very small numbers. It has been known for years in the locality under consideration [the extreme

south of Nyasaland] that cotton bursting during September and October is almost invariably of good quality, and it seems probable that insect pests are controlled by some climatic agency at that season. The cotton pests seem to reappear between the middle and the end of October, and on 18th October very late planted cotton was found infested with larvae of *Diparopsis castanea*, Hmps. (red bollworm), several moths were caught, and nymphs of cotton stainers were numerous. It appears probable that *Heliothis (Chloridea) obsoleta*, F. (American bollworm) did more damage during the past season than *D. castanea*. The value of the method of stripping the plants and destroying the first flush of flower buds and squares (in an attempt to control bollworms by destroying the first brood) is doubtful, since by so doing the crop is made later and flowering and fruiting forced into the period of maximum bollworm activity in April. If it is confirmed that the incidence of pests is to a large extent seasonal, as is suspected at present, it should be possible by the aid of records that are being kept of factors affecting the crop, such as rainfall, temperature and the development of the several varieties of cotton, to devise ways of evading the pests sufficiently to ensure a good crop.

STOCK (T. D.). **Entomology.**—*Rept. Dept. Agric. Burma, 1925-26*, pp. 16-17. Rangoon, 1926. [Recd. February 1927.]

Pests reported during the year included : *Cirphis unipuncta*, Haw., *Hispa armigera*, Ol., *Schoenobius incertellus*, Wlk. (*bipunctifer*, Wlk.), and *Anomala* sp., on rice ; *Agrotis ypsilon*, Rott. (greasy surface caterpillar), on tobacco ; *Brachytrypes portentosus*, Licht. (large brown cricket), on garden crops ; and *Cryptorrhynchus gravis*, F. (mango weevil), on mango fruits. More than nine alternative food-plants have been found for the spotted bollworms, *Earias fabia*, Stoll, and *E. insulana*, Boisd., of which cotton is the most attractive, particularly the varieties with succulent bolls. Two of these plants, *Abutilon indicum* and *Hibiscus panduriformis*, occur extensively and may persist throughout the year. These two moths breed throughout the year, and their life-cycles occupy about 4 weeks. Five parasites, which include *Bracon (Microbracon) lefroyi*, D. & G., *Rhogas testaceus*, Grav., and *Actia aegyptia*, Vill., although present throughout the season, did not control them. Fallen buds and mature bolls, but not the dry fruits, harbour a large number of these bollworms, and as both mature and dry bolls harbour numerous individuals of *Platyedra (Pectinophora) gossypiella*, Saund. (pink bollworm), the effective disposal of any bolls left on the plants after harvest is important. The latter insect has not been observed on any plant but cotton.

RHIND (D.). **Preliminary Note on an Internal Boll Disease of Cotton in Burma.**—*Agric. Jl. India*, xxii, pt. 1, pp. 34-38, 3 refs. Calcutta, January 1927.

Serious damage to cotton in Burma is caused by internal disease of unripe bolls, which is the result of infestation by two species of *Nematospora* ; a yellow or brown discolouration of the lint occurs first and is followed by the rotting of the entire contents of the boll. Burmese types of cotton are apparently less affected by the disease than an American type. The disease frequently occurs in bolls attacked by bollworms, but is more often not associated with bollworm injury.

Diseased bolls were first seen in November and became more numerous until the end of January, but by the middle of March cotton on which 87.5 per cent. of the bolls had been infected on 17th December was almost free from disease. This periodicity of the disease corresponds with the increase and decrease of *Dysdercus cingulatus*, F., which is abundant on cotton and other plants from October to the end of January, but occurs only in small numbers in February and March. The diseased bolls exhibit no external symptoms, but the inner surface of the wall invariably shows signs of having been punctured by insects in one or more places, the species responsible being *D. cingulatus*. The fungi producing the disease corresponded very closely with the species C and D described by W. Nowell in the West Indies, the former being the commoner and the one with which all experiments were made.

The disease was produced in healthy bolls by injecting a suspension of spores with a hypodermic syringe, while controls injected with sterile water remained healthy, insects being excluded from the plants for five weeks. The disease was also produced in 28 out of 30 bolls on which *Dysdercus cingulatus* had been allowed to feed for 32 days, after feeding on diseased bolls. The method by which the spores enter the bolls was not determined; the size of the spores makes it unlikely that they would be carried by the mouth-parts of *D. cingulatus* except on the outside of them. Infection was not produced by pricking the bolls with sterile needles and placing spores on the outside.

WEBSTER (J. F.). [**Locust Campaign.**—*Mthly. Agric. Bull., Iraq*, 16th Dec. 1926–15th Jan. 1927, 1 p. Baghdad, January 1927.

*Locusta migratoria*, L., is recorded as damaging maize crops in late autumn but it does not seem to have arrived in sufficient numbers to become serious.

AITKEN (H. H.) & THOMAS (H. H.). **Plant Pests and Diseases, how to identify and how to destroy them.**—8vo, viii+120 pp., 48 figs. London, Cassell & Co., Ltd., 1926. Price 1s. 6d.

This booklet is designed to give practical information on the simplest and most effective methods of controlling the common pests and diseases of garden plants in Britain. In the first eight chapters (65 pages) brief accounts are given of the life-history of insect and other pests of lawns, flower gardens, fruits, vegetables and greenhouses, with descriptions of the nature of the damage that they cause and references to the control measures, which are described in two of the succeeding chapters. Three other chapters contain hints on spraying, notes on natural enemies of insect pests, and a pest control calendar. Only popular names are used throughout.

SMITH (K. M.). **Observations on the Insect Carriers of Mosaic Disease of the Potato.**—*Ann. App. Biol.*, xiv, no. 1, pp. 113–131, 3 pls., 1 fig., 10 refs. Cambridge, February 1927.

The experiments recorded in this paper were carried out with the object of determining which insect pests of the potato plant are instrumental in transmitting mosaic disease. The technique employed

is explained, and the type of cage devised to protect the plants during the observations is described. Previous trials, conducted during 1922-24, are briefly outlined. Inoculations were obtained by inducing insects previously infected by breeding on mosaic-infected potato plants to feed both on the haulm and on the sprouts of the tuber. In the latter case the results were entirely negative. Former investigators have attempted transmission from sprouts of infected to sprouts of healthy tubers and have recorded successful inoculations by the Aphids, *Myzus persicae*, Sulz., *Macrosiphum gei*, Koch (*solanifolii*, Ashm.), and *Aphis abbreviata*, Patch, while there seemed little doubt but that insects other than Aphids also act as carriers of the virus in many plants of different orders.

The present preliminary investigations show some definite evidence of successful transmission of mosaic disease by means of certain insects, their degree of efficiency in this respect varying greatly; for example, tubers from plants inoculated by *M. persicae* gave rise to infected plants in every case; those from plants inoculated by the leafhoppers, *Erythroneura* (*Zygina*) *pallidifrons*, Edw., and *Eupteryx auratus*, L., gave rise to one infected case out of four; the whitefly, *Trialeurodes* (*Asterochiton*) *vaporariorum*, Westw., produced two infections out of four. The Capsid bugs, *Calocoris norvegicus*, Gmel. (*bipunctatus*, F.) and *Lygus pabulinus*, L., entirely failed to transmit the disease. These variations may be due to the method of feeding of the insects or to some requirement of the virus. While it seems clear that *Myzus persicae* and *Macrosiphum gei* can act as carriers of potato mosaic under certain conditions, it is not possible at present to say what these conditions may be. The author has not as yet been able to produce symptoms of mosaic disease in a potato plant in the same year as that in which inoculations were made by Aphids on the haulm; the disease has only appeared in plants arising from the experimental plants in the following year. In the case of inoculation by Aphids upon sprouting tubers it seems possible to produce current season symptoms; but leafhoppers will not feed upon the sprouts, and Capsids can only be induced to do so with great difficulty.

JAMES (H. C.). **The Life History and Bionomics of a British Phytophagous Chalcidoid of the Genus *Harmolita* (*Isosoma*).** —*Ann. App. Biol.*, xiv, no. 1, pp. 132-149, 12 figs., 5 refs. Cambridge, February 1927.

An account is given of the bionomics of *Harmolita graminicola*, Gir., which forms galls on *Triticum* (*Agropyrum*) *repens* (couch grass, in Britain. The stages of the insect are described, as well as the larva of another undetermined species of *Harmolita*, also gallicolous on *T. repens*. Many species of this genus, such as *H. tritici*, Fitch, the wheat jointworm of America and Russia, are pests on cereals and cultivated grasses, but neither of the species dealt with in this paper could be induced to breed on wheat or any other plants of the genus *Triticum*. The adult of *H. graminicola* emerges during the last week in June and the first week of July. One egg is deposited on each culm just beneath the rudimentary inflorescence, but the inflorescence is never attacked after it has broken through the sheath. In captivity, the incubation period lasted between 3 and 4 weeks. Parthenogenesis was not

observed, but the evidence is not conclusive in this respect. The larva becomes mature in October and hibernates in this condition. Pupation occurs in late April or mid-May, and the adult emerges about 40 days later, there being one generation a year. The late larval instars of *H. graminicola* are parasitised by the larva of *Bracon erythrostictus*, Lyle; no other insect parasites were found.

PAPACHRYSOSTOMOU (C.). **Entomological Notes.**—*Cyprus Agric. Jl.*, xxii, pt. 1, pp. 7-8. Nicosia, January 1927.

Severe injury to potato foliage was caused by *Laphygma exigua*, Hb., which was abundant throughout Cyprus in 1926 and also caused considerable damage to the leaves of onions and attacked other plants, including tomatos, beans and turnips. The larvae can easily be controlled by spraying with lead arsenate or Paris green. The larvae of *Pyrameis* (*Neopyrameis*) *cardui*, L., were also very abundant in 1926, and caused serious damage to artichokes [*Cynara*], over two acres being completely destroyed in one locality; in another, tomatos, egg-plants [*Solanum melongena*], melons, cucumbers, and other plants were attacked after the available artichokes had been destroyed.

TEODORO (G.). **Considerazioni sulle Cocciniglie parassite e loro piante nutrici.** [Considerations on parasitic Coccids and their Food-plants.]—*Riv. Biologia*, viii, no. 6, pp. 629-637, 5 refs. Milan, November-December, 1926. [Recd. February 1927.]

This is a general discussion of Coccids in relation to their food-plants. The distribution of the sub-families among the various plant-groups is reviewed and is also shown in a table. Distinctly polyphagous species tend to occur in each genus, but as regards geographical distribution the monophagous or quasi-monophagous species are often more widespread. The paper closes with some notes on the relations between Coccids and substances such as resins contained in the food-plants.

RUSSO (G.). **Descrizione di una nuova specie di Chalcidide ectoparassita dei Coleotteri Ipidi.** [Description of a new Species of Chalcid ectoparasitic on Scolytid Beetles.]—*Ann. R. Istit. sup. agrar.*, (3) i, pp. 75-86. Portici, 1926. [Recd. February 1927.]

*Eurytoma masii*, sp. n., is described from Sicily as a parasite of the Scolytids, *Chaetoptelius vestitus*, Muls. & Rey, in pistachio, *Scolytus* (*Eccoptyogaster*) *amygdali*, Guér., in almond, and *Hylesinus oleiperda*, F., and *Phloeotribus scarabaeoides*, Bern., in olive. In Italy it was found to attack the last two and also *H. fraxini*, Panz., in olive and *S. (E.) rugulosus*, Ratz., in apricot and plum. The adult Chalcids emerge in April, after hibernating in the larval stage. The eggs are laid on larvae or pupae of the beetles, the former being paralysed by the ovipositor, and the life-cycle requires about 20-30 days. Adults are present up to the end of October. This parasite is very active and in conjunction with *Cheiropachus colon*, L., and *Cerocephala cornigera*, Westw., can destroy up to 50 per cent. of the Scolytid larvae and pupae in the plants mentioned.

MALENOTTI (E.). **Osservazioni sull' *Antispila rivillei*. Stett.** [Observations on *A. rivillei*.]—*Italia vinicola ed agraria*, 1927, no. 2, reprint, 3 pp. Casalmoferrato, 9th January 1927.

While the Tineid, *Antispila rivillei*, Staint., does not cause any considerable loss of grapes in Italy, the feeding of the three or four summer generations results in the leaves being injured to such an extent that the grapes do not ripen normally and the foliage fails to give shade. The larva mines the leaf and consumes the internal tissues except the larger nervures: it then cuts out an oval through both surfaces of the leaf and fastens the two pieces together to form a shelter within which it spins its cocoon and pupates. The larva either carries the leaf-envelope to a suitable resting place or drops with it by a thread and remains hanging until blown on to a vine-stock or a stake, when it is able to crawl to a refuge. It does not pupate on the ground, as does *A. isabella*, Clem., in the United States [*R.A.E.*, A, xiv, 356], and the cocoons may therefore be destroyed by crushing or treating with solutions of nicotine or tarry emulsions.

LESNE (P.). **Quelques particularités biologiques des *Gastroidea* (Chrysomelidae).**—*Encyc. entom.*, Sér. B I, Coleopt., ii, fasc. 2, pp. 95–96. Paris, Lechevalier, 1927.

The French species of the genus *Gastroidea* (*G. viridula*, DeG. and *G. polygoni*, L.) are well-known pests of species of *Rumex* and *Polygonum*, the former being particularly injurious to cultivated sorrel. In recent years, these insects seem to have been adapting themselves to imported Polygonaceae, especially rhubarb, of which several species are cultivated in French gardens. *G. viridula* has been recorded on this plant in France and Denmark and *G. polygoni* in Germany. It is doubtful, however, whether complete development could occur on rhubarb. Insect enemies of the larvae include the predacious Histerid, *Saprinus virescens*, Payk., and the parasites, *Bracon fuscipennis*, Wesm., and *Meigenia floralis*, Meig.

FEYTAUD (J.). **La bruche des haricots (*Acanthoscelides obtectus* Say).**—*Rev. Zool. agric. & appl.*, xxv, no. 11, pp. 161–172, 4 figs. Bordeaux, November 1926. [Recd. February 1927.]

The bean Bruchid, *Bruchus* (*Acanthoscelides*) *obtectus*, Say, was unknown in Europe until towards the close of the nineteenth century, when it was introduced, probably from North America. In France it first appeared in Provence, and it was unknown in other parts of the country until after 1900, but it is now widely distributed and is causing apprehension in the south-west, having been very injurious in Corrèze and Dordogne in the last few years. Its rapid spread since 1914 has probably been due to the importation of beans from America. Other injurious Bruchids that occur in France are *B. (Larid) pisorum*, L. (*pisi*, L.), in peas, *B. (L.) rufimanus*, Boh. (*granarius*, L.), in broad beans, and *B. (L.) lentis*, Boh., and in the south, *B. (L.) pallidicornis*, Boh., and *B. (L.) tristis*, Boh., in lentils, the last also attacking chick-peas [*Cicer arietinum*].

The biology and stages of *B. obtectus* are described [*cf. R.A.E.*, A, vi, 468]. In the field the eggs of the first generation are laid in ripe pods containing fully developed beans, being inserted either in existing holes, such as those made by caterpillars or by the partial

opening of the pods, or in holes made by the females with their mandibles. The adults produced from these eggs emerge from the beans when they are in store, where an indefinite number of generations may be produced. In the south-west of France there are usually four generations a year, the life-cycle occupying about 2 months in the summer. According to the temperature, the eggs hatch in 1–3 weeks, the larval period occupies 1–2 months, or up to 6 months for the last generation, and the pupal period 1–3 weeks, while the adults live 10–15 days in the summer and 2 months or more in the winter. Infestation of beans in the field takes place either through flight of the beetles from the store over limited distances, or through the sowing of infested seed. No parasites of *B. oblectus* have yet been recorded in France, but in other countries large numbers of larvae are killed by the mite, *Pediculoides ventricosus*, Newp., and it is probable that among the few Braconids and many Chalcids that attack related species some will be found that attack *B. oblectus*.

GAUTIER (C.). **Nouvelles recherches sur l'hibernation de *Tingis pyri* Fab. (Hem. Tingitidae).**—*Bull. Soc. ent. France*, 1927, no. 1, pp. 12–13, 1 ref. Paris, 1927.

According to A. Costa the adults of *Stephanitis (Tingis) pyri*, F., hibernate under loose bark, but in the course of several winters, during which he found adults hibernating under strawberry leaves [*R.A.E.*, A, xiii, 296], the author failed to find any hibernating adults in bark. In January, 1926, however, a correspondent found hibernating adults of *S. pyri* under the bark of a pear tree, and in November the author himself found them under the bark of an apple tree, as well as several large groups under strawberry leaves.

GAUTIER (C.). **A propos de *Stethoconus cyrtopeltis* Flor (Hem. Capsidae) ennemi de *Tingis pyri* Fab. (Hem. Tingitidae).**—*Bull. Soc. ent. France*, 1927, no. 2, pp. 26–27, 1 ref. Paris, 1927.

The author describes the method of feeding of *Stethoconus cyrtopeltis*, Flor, the larvae and adults of which he observed preying on the larvae of *Stephanitis (Tingis) pyri*, F., at Châtillon-d'Azergues (Rhône) in July and August. These observations agree with those of Durante on an undetermined bug predacious on *S. pyri* in Italy [*R.A.E.*, A, v, 342]. Only a few individuals were seen, so that this Capsid cannot be regarded as an important natural enemy of *S. pyri*.

v. SENGBUSCH (R.). **Beitrag zur Biologie des Rübenematoden *Heterodera schachtii*.** [A Contribution to the Biology of the Beet Nematode, *H. schachtii*.]—*Zeitschr. Pflanzenkr.*, xxxvii, no. 3–4, pp. 86–102, 11 figs., 30 refs. Stuttgart, 1927.

This paper deals with various aspects of the bionomics of the beet Nematode, *Heterodera schachtii*. The larvae can penetrate through sound epidermis into the root, but often enter through wounds or the places left by dead root hairs. The adult life of the male lasts at least 15 days. There is no sharp differentiation between the "summer female" and the "permanent cyst" (the female form that hibernates

and ensures the continuance of the species); the only difference is one of rapidity of development, and in some cases where conditions are unfavourable the quick-developing form becomes a slow-developing one. The proportion of the sexes observed was about 80 males to 100 females. A female requires about 5–30 times as much food as a male, and males can develop on plants that are unable (owing to disease) to supply sufficient food for females. Thus only healthy roots must be used when investigating the proportion of the sexes.

BREMER (H.) & KAUFMANN (O.). **Die Bekämpfung der Rübenfliege (*Pegomya hyoscyami*, Pz.) mit Fluornatrium und Kieselfluornatrium.** [Work against the Beet-fly, *P. hyoscyami*, with Sodium Fluoride and Sodium Fluosilicate.]—*Anz. Schädlingsk.*, iii, no. 2, pp. 13–15. Berlin, 15th February 1927.

As the beet-fly, *Pegomya hyoscyami*, is best combated in the adult stage, sweetened bait-sprays have been tried with satisfactory results [*R.A.E.*, A, xiv, 376]. The sodium arsenate used is, however, apt to injure the tender leaves, so that while this is satisfactory against the second and third generations it cannot be employed against the first, which is the most important one. Field tests made in July and August showed that sodium fluoride and sodium fluosilicate are excellent stomach poisons against *P. hyoscyami* and harmless to beet at the strengths required, viz., a 0·4 per cent. solution of either, containing 2·5 per cent. of raw sugar. Molasses was satisfactory as a sweetener. The spray should be applied at the beginning of the oviposition period, and the best result is obtained if several rainless days follow the treatment.

REH (L.). **Bekämpfung der Buchenrinden-Wollaus und der Blutlaus.** [Measures against the Beech Coccus and the Woolly Aphis.]—*Anz. Schädlingsk.*, iii, no. 2, pp. 19–21, 2 figs. Berlin, 15th February 1927.

An infestation of beeches near Hamburg by *Cryptococcus fagi*, Bärenspr., against which the usual measures had only a temporary effect (a strong solution of nicotine prevents reinfestation for 6 months), was finally controlled by painting the trunks with a mixture of equal parts of coal-tar and petroleum. It was previously thought that this measure would kill the tree, but in this instance trees treated in 1914 were quite healthy and vigorous in 1925. Owing to its cost this method can be employed only in the case of specially valuable trees. The application should be made in February, and in dry, cloudy weather. Apple trees can be kept free from the woolly aphis [*Eriosoma lanigerum*, Hausm.] by painting in spring with a mixture of 2 parts wood-tar and 3 parts linseed oil, petroleum being added until the consistency is suitable for painting. It is necessary to brush and scrape the trunk and branches in the preceding autumn and again just before making the application. This mixture is also useful against *Hylesinus fraxini*, Panz., in ash; it enters the mines and kills the adults and larvae.

SCHLENZ (P.). **Schädigungen im Obst- und Gartenbau durch den Ohrwurm.** [Injuries in Orchards and Gardens by the Earwig.]—*Anz. Schädlingssk.*, iii, no. 2, pp. 22–23. Berlin, 15th February 1927.

In some years considerable damage is done in Germany by earwigs [*Forficula auricularia*]. The actual injury to fruit is so small as to pass unnoticed until it begins to rot; this usually occurs where the fruits touch each other. Apples are preferred to pears.

WIESMANN (R.). **Trichopterenlarven an technisch verarbeitetem Holze.** [Trichopterous Larvae in worked Timber.]—*Schweiz. Zeitschr. Forstwesen*, 1926, 3 figs., 1 pl. (Abstract in *Anz. Schädlingssk.*, iii, no. 2, p. 23. Berlin, 15th February 1927.)

In the course of repairs to an old wooden bridge at Zürich it was found that timbers of oak and larch had been bored under water by Hydropsychid larvae, chiefly *Hydropsyche pellucida*. The whole structure was becoming loose owing to attack at places where the beams were pinned. There were numbers of mines up to  $1\frac{3}{4}$  inch in depth and running in part parallel with the annual rings of the wood. Except for a short note by Silfvenius in 1907 from Finland, cases of severe injury by Trichopterous larvae seem to be unknown.

[VUKASOVIĆ] VOUKASSOVITCH (P.). **Observations biologiques sur le *Macrocentrus abdominalis*, Fab., Braconide parasite.**—*C.R. Soc. Biol.*, xcvi, no. 6, pp. 379–381. Paris, 18th February 1927.

An account is given of *Macrocentrus abdominalis*, F., observed in Serbia during 1925 and 1926 as a parasite of the larvae of *Psammotis hyalinalis*, Hb. The larvae of this Braconid, which is, in general, of rare occurrence, are gregarious in the body of the host, which remains healthy-looking until the second or third day before it is abandoned by the parasites, when it changes colour and ceases movement. The larvae then emerge practically simultaneously and attach themselves to the host, of which they consume everything but the empty skin. A loose cocoon is then constructed to shelter the whole group of larvae, inside which each larva spins its own cocoon. About 13 to 16 days after leaving the host the adult parasites appear, the pupal stage having lasted 9 or 10 days at 71° to 73° F. From 17 to 41 parasites have been obtained from one larval host. In 21 cases out of 25, all the larvae emerging from one host were of one sex (males in 8 instances and females in 13), indicating that polyembryony occurs. The massed cocoons have only been found at the beginning of August, and all the adults emerged between 20th August and 5th September, so that it would seem that *P. hyalinalis* only acts as host during a definite period of the year. *M. abdominalis* is itself parasitised by a species of *Hemiteles* in large numbers and a Chalcid of the genus *Habrocytus*.

OZOLS (E.). **Cinas līdzekļi pret zemeņu lapgrauzi (*Galerucella tenella* L.).** [Experiments in the Control of *G. tenella*.] [In Latvian.]—*Rept. Inst. Plant Prot. 1925–26*, pp. 2–9, 11 figs. Latvian Agric. Soc., Riga, 1926.

*Galerucella tenella*, L. (strawberry beetle) was controlled in small gardens in Latvia by beating the bushes in spring and catching the

beetles in nets. In larger plantations spraying with a 1 per cent. solution of lead arsenate gave a mortality of 100 per cent. The beetles are very resistant to hydrocyanic acid gas, and 11 grains of potassium cyanide to 1 cu. ft. of space does not always kill them.

**BRAMANIS (L.). Pētījumi par *Hylobius abietis*, L.** [A Study of *H. abietis*.] [In Latvian.]—*Rept. Inst. Plant Prot. 1925-26*, pp. 9-15, 1 fig. Latvian Agric. Soc., Riga, 1926.

*Hylobius abietis*, L., damaged 2-24 per cent. of two-year-old trees of *Pinus sylvestris*, and also injured *Picea excelsa*, *Juniperus communis*, and shoots of willow, *Populus tremula*, oak and birch. It was found that 33-144 adults developed in a single trunk. The weevils preferred trees growing in drier situations not covered by any vegetation. Trapping experiments were made with trenches (total length about 210 yards), and pieces of wood and bark [cf. *R.A.E.*, A, iv, 499] on cleared land that had to be afforested, and in this way 10,000 weevils were destroyed in two months on about  $2\frac{1}{2}$  acres of ground.

**ZIRNITS (J.). Daži mēginājumi cīnā ar kulturaugu kaitekliem.** [Control Measures against some Injurious Insects.] [In Latvian.]—*Rept. Inst. Plant Prot. 1925-26*, pp. 17-18. Latvian Agric. Soc., Riga, 1926.

In experiments against *Lygus kalmi*, L., on carrot seedlings, emulsions containing  $\frac{1}{4}$  per cent. of soft soap and 4 per cent. of petroleum, or 2 per cent. of soft soap and  $\frac{1}{2}$  per cent. of carbolic acid destroyed all the immature stages and some of the adults; a 2 per cent. solution of soft soap, used alone or containing 3 per cent. methylated spirit, only destroyed the immature stages. None of these emulsions injures the blossoms.

Experiments were made on the influence of sowing barley at different depths on injury by *Agriotes sputator*, L., and in trial plots the yield from barley sown at a depth of  $\frac{1}{5}$  in. was 100 per cent. greater than from that sown at  $3\frac{1}{5}$  in. In the field, however, the difference was only 15 per cent.

**ZIRNITS (J.). Novērojumi par dažiem kulturaugu kaitekliem 1925. g.** [Observations in 1925 on some Insects injurious to Cultivated Plants.] [In Latvian.]—*Rept. Inst. Plant Prot. 1925-26*, pp. 18-20. Latvian Agric. Soc., Riga, 1926.

Among the Rhynchota injurious to cultivated plants in 1925 were the following: *Macrosiphum granarium*, Kirby, *Amphorophora* (*Rhopalosiphum*) *rubi*, Kalt., *Illinoia* (M.) *pisi*, Kalt., *Capitophorus* (R.) *ribis*, L., *Aphis* (*Siphonaphis*) *padi*, L., *A. craccae*, L., *A. pomi*, DeG., *A. grossulariae*, Kalt., *A. idaei*, v. d.G., *Cavariella* (*Siphocoryne*) *capreae*, F., *Hyadaphis* (S.) *xylostei*, Schr., *Myzus* (*Myzoides*) *cerasi*, F., *Hyalopteris arundinis*, F. (*pruni*, F.), *Lygus kalmi*, L., and *L. pabulinus*, L.

**JOHNS (O.). Par *Thrips tabaci* v. *pullus* Uz. kā siltumnīcu kaitekli.** [*T. tabaci* var. *pullus* as a Hot-house Pest.] [In Latvian.]—*Rept. Inst. Plant Prot. 1925-26*, pp. 20-21. Latvian Agric. Soc., Riga, 1926.

*Thrips tabaci* var. *pullus*, Uz., is recorded as injuring the undeveloped buds of cyclamens in hot-houses, and such flowers as subsequently

developed had crippled petals. The other thrips that are pests in hot-houses (*Heliothrips haemorrhoidalis*, Bch., *H. femoralis*, Reut., and *Parthenothrips dracaenae*, Heeg.) have all been imported from the tropics. *T. tabaci*, Lind. (with its var. *pullus*) is, however, a common pest in Latvia, and it has been observed on a great variety of plants in the open.

KONDE (O.). **Jauns kartupelu kaiteklis**—*Pachyprotasis variegata*, Fall. [*P. variegata* a New Pest of Potato.] [*In Latvian.*]—*Rept. Inst. Plant Prot.* 1925–26, pp. 21–22, 4 figs. Latvian Agric. Soc., Riga, 1926. (With a Summary in German.)

A description is given of the larva of the Tenthredinid, *Pachyprotasis variegata*, Fall., which has been observed in large numbers on potato plants growing amongst cereals.

ZRIAKOVSKI (V.). **La sauterelle d'Asie dans le gouvernement du Térek durant la période 1922–1925.**—*Ber. Stat. Déf. Plant. gouv. Térek*, i, no. 2, p. 35. 1926. (In Russian with French summary.) (Abstract in *Centralbl. Bakt. Paras., Infekt.*, 2te Abt., lxi, no. 15–24, pp. 508–509. Jena, 28th February 1927.)

In addition to *Locusta migratoria*, L., the following locusts occur in Térek, North Caucasus: *Calliptamus italicus*, L., *Stauroderus scalaris*, F. W., *Oedaleus decorus*, Germ., *O[edipoda] miniata*, Pall., *Psophus stridulus*, L., and *Dociostaurus maroccanus*, Thunb. Attempts to control *L. migratoria* by dusting with arsenicals from aeroplanes proved unsuccessful.

[DEKHTYAREV (N.).] **Дехтярев (Н.). The Apple Leaf-roller.** [*In Russian.*]—*Visnik Plodovodstva, Vinogradarstva ta Gorodnitsstva* [*Herald of Hortic. & Vitic.*], 1926, no. 12, pp. 524–530, 1 fig., 1 ref. Kharkov, December 1926.

*Hemerophila (Simaethis) pariana*, Cl., is widely distributed throughout the Ukraine, but the injury it does is frequently mistaken for that caused by *Hyponomeuta malinellus*, Zell. The life-history has not been definitely worked out. The larvae occur from the end of April to the end of October. There are probably three generations a year, the winter being passed in the adult and possibly the pupal stages. The leaves of apple are skeletonised by the larvae during May, and the resulting adults, which appear in June, lay their eggs at the base or at the central vein of the leaves. The greatest damage is done by the larvae in July, the injury to the foliage reacting on the general condition of the trees.

Spraying with lead arsenate with the addition of glue is recommended against the larvae. The correct timing of the spray is most important; it should be applied before the opening of the flower buds, a second application should be made when all the petals have fallen, and a third 2–3 weeks later. It is advisable to spray again after harvest.

[GAVALOV (I.).] **Гавалов (И.). Some Injurious Insects observed in the Crimea 1922–1925.** [*In Russian.*]—*Acta Soc. ent. staurop.*, iii, no. 1, reprint 11 pp., 2 refs. Stavropol, 1927.

This is an annotated list of insect pests observed in the Crimea in the years 1922–25, arranged under the crops attacked.

[STARK (V. N.).] **Старк (В. Н.).** *Scolytus (Eccoptogaster) intricatus*, **Ratz., on Branches of *Betula verrucosa*.** [In Russian.]—*Rev. russe Ent.*, xx, no. 1-2, pp. 82-84. Leningrad, 1926. (With a Summary in German.)

*Scolytus intricatus*, Ratz., has been found boring in birch though oak, its natural food-plant, was abundant in the same area of the Bryansk forest. The larvae do not penetrate so far for pupation in birch as in oak, but the duration of the pupal stage is prolonged, lasting 39 days in birch and 24 in oak. Under experimental conditions the adults, whether from birch or oak, refused birch for maturation feeding, but readily accepted oak. The individuals issuing from birch are somewhat smaller than those from oak. Experiments were made to ascertain whether individuals from one food-plant would oviposit on the other. When transferred from oak to birch they all died without laying eggs. Eggs were laid, however, on birch and oak by adults reared from birch. The number laid on oak by these individuals was even greater than that laid by individuals reared on oak, and the resulting larvae developed more rapidly, though those from eggs laid on birch took longer to develop, and many died.

[STARK (V. N.).] **Старк (В. Н.).** **Contribution to the Bark-beetle Fauna of the Vitebsk Government.** [In Russian.]—*Rev. russe Ent.*, xx, no. 1-2, pp. 101-105. Leningrad, 1926. (With a Summary in French.)

This is an annotated list of 50 Scolytids recorded from Vitebsk.

BLANCHARD (E. E.). **A Dipterous Leaf-miner on *Cineraria* new to Science.**—*Rev. Soc. ent. argentina*, i, no. 1, pp. 10-11, 1 fig., 1 pl. Buenos Aires, 30th June 1926. [Recd. February 1927.]

*Agromyza huidobrensis*, sp. n., is described from Argentina from cultivated *Cineraria*, the leaves of which are mined by the larvae. The eggs are deposited in the leaf-tissue on the underside and hatch in 4-9 days. The larval stage may last from 10 to 25 days according to the temperature. The pupae are attached to the underside of the leaf, the pupal stage lasting 9-15 days. There are probably five generations a year at the latitude of Buenos Aires.

DE AZEVEDO MARQUES (L. A.). **Pragas do Algodoeiro II.** [Cotton Pests II.]—*Bol. Minist. Agric. Ind. e Comm.*, xv (ii), no. 6, pp. 744-747, 8 figs. Rio de Janeiro, December 1926.

A brief account is given of *Alabama argillacea*, Hb., which is a pest of cotton in Brazil.

JEPSON (F. P.) & GADD (C. H.). **Manuring in Relation to the Control of Shot-hole Borer of Tea (*Xyleborus fornicatus*, Eichh.).**—*Dept. Agric., Ceylon.*, Bull. 78, 49 pp., 5 diagr., 7 refs. Peradeniya, December 1926.

A full account is given of experiments with various manures in relation to injury to tea by *Xyleborus fornicatus*, Eichh. (shot-hole borer), some of the more important results of which have already

been noticed [*R.A.E.*, A, xiii, 357 ; xiv, 425], together with a discussion of the problem of control and a brief account of earlier manurial experiments [*R.A.E.*, A, x, 540 ; xi, 425]. An area of old tea bushes that had not been manured until the previous year and were severely attacked by *X. fornicatus* was chosen for the experiment, and was divided into plots and sub-plots arranged so as to obviate the effect of local variations in infestation. The manurial applications were made in August 1923 and August 1924, and the detailed examinations of a given number of bushes on each plot were carried out in September 1924 and March 1925. Records were made of the total number of branches, open galleries and healed galleries, and of the number of galleries occupied and empty in 25 open ones from each plot, together with the number of borers of all stages in the occupied galleries ; these records are tabulated, and the conclusions drawn from them are discussed at length by C. H. Gadd.

The average number of galleries, open and healed, in each branch on a plot gives a measure of the intensity of attack ; the attack was somewhat lighter on the plots treated with potassic manures, but the degree to which potash decreases the susceptibility to attack is probably too small to be of much practical value. In every case the percentage of gallery entrances that had healed over was higher on the treated than on the control plots, the difference being particularly marked at the first examination, when it was 17.1 on the sodium nitrate plot and 15.5 on the ammonium sulphate plot. The healing of shot-hole borer galleries occurs in all vigorous tea bushes, and is accomplished by the formation of new tissue over the entrances, a process that is dependent on food-supply and is apparently favoured especially by nitrogen. The average time taken for the gallery entrances to heal over on the different plots was found to be 3.75 months for the control plot, 3.2 months for the phosphoric acid plots, 3 months for the potash plots, 2.95 months for the lime plot and 2.92 months for the nitrogen plots, showing that the time between the beginning of a gallery and its complete healing over may be reduced by 3 weeks by the application of manures. The beneficial effect of lime is probably due to its liberation of potash in the soil, not to its influence on soil acidity, as the results obtained with it were very similar to those obtained with potassic manures.

The severity of shot-hole borer attack is commonly estimated by planters by the number of broken branches, and the damage has been observed to be greater during periods of drought ; this may be due merely to the fact that any climatic condition, such as drought, that reduces the assimilation of food materials by the bushes retards the healing of galleries, so that more branches are broken.

DE BERGEVIN (E.). **Note sur *Trioza alacris* Flor, parasite de *Laurus nobilis* L., et son prédateur *Anthocoris minki* Dohrn.**—*Bull. Soc. Hist. nat. Afr. N.*, xvii, no. 8, pp. 247-249, 2 refs. Algiers, 1926. [Recd. February 1927.]

The author records the occurrence of the Psyllid, *Trioza alacris*, Flor, forming galls on the leaves and young shoots of *Laurus nobilis*, in Algeria ; it is attacked in the larval stage by *Anthocoris minki*, Dohrn. *T. alacris* had not previously been found in Algeria, although *L. nobilis* is indigenous there, but was known in southern Europe and also in California, where it was introduced on *L. nobilis* from Belgium.

*A. gallarum-ulmi*, DeG., which is closely allied to *A. minki*, is stated by Reuter to live in the galls of *Eriosoma* (*Schizoneura*) *ulmi*, L., and to feed on the excrement of the Aphids, but the author considers it most probable that it attacks the Aphids themselves. A third predacious Anthocorid, *Montandoniella moraguesi*, Put., feeds on the eggs of *Phloeothrips ficorum*, Marchal, which is a serious pest of exotic fig trees in Algiers.

Ghesquière (J.). **Notes sur les Coccides parasites des agrumes au Congo belge.**—*Rev. zool. afr.*, xiv, pt. 3, pp. 310-316, 2 figs., 6 refs. Brussels, 1st February 1927.

The following Coccids that have been found on *Citrus* in the Belgian Congo are for the most part widely distributed tropical species introduced comparatively recently: *Pseudococcus citri*, Risso, fostered by *Oecophylla* and *Pseudolasius gowdeyi*, Wheeler; *P. brevipes*, Ckll. (*bromeliae*, auct.), fostered by underground ants of the genus *Camponotus*; *Lepidosaphes pinnaeformis*, Bch., which is infested by *Sphaerostilbe coccophila*, *Ophionectria coccicola* and *Nectria* sp.; *Chionaspis citri*, Comst.; *Ischnaspis longirostris*, Sign.; *Chrysomphalus aurantii*, Mask., which is attacked by *S. coccophila* and the Coccinellid, *Chilocorus discoideus*, Crotch; *Pseudonidia trilobitiformis*, Green; *Coccus* (*Lecanium*) *hesperidum*, L., which is attacked by *Cephalosporium* sp., a Proctotrupid (? *Coccidoxenus* sp.) and a Coccinellid, *Chilocorus bipustulatus*, L., and is sometimes fostered by *Oecophylla*; *Ceroplastes* sp., also fostered by *Oecophylla*; *Icerya purchasi*, Mask.; and *I. tremae*, Vayss. Notes are given on the alternative food-plants of these Coccids and their distribution in the Belgian Congo.

Schouteden (H.). **Un scolyte parasite des noix de palmes.**—*Rev. zool. afr.*, xiv, pt. 3, pp. [114]-[116]. Brussels, 1st February 1927.

The author does not consider *Coccotrypes congonus*, Eggers, to be a pest of oil palms [*Elaeis guineensis*], as it only attacks nuts left on the ground [R.A.E., A, xiii, 109], but it has been reported injuring the nuts of *Sclerosperma manni*, of which it may become a more serious pest.

Ghesquière (J.). **Quelques observations sur la mante prieuse congolaise *Sphodromantis lineola*, Burm.**—*Rev. zool. afr.*, xiv, pt. 3, pp. [112]-[113]. Brussels, 1st February 1927.

*Citrus* at Eala in the Belgian Congo was severely attacked by the Coreid, *Anoplocnemis curvipes*, F., and a Pentatomid, *Nezara* sp. All stages of the Mantid, *Sphodromantis lineola*, Burm., were observed on the trees. The young Mantid larvae feed on *Toxoptera aurantii*, Boy. (of which there are numerous colonies on *Citrus*) and the young larvae of *A. curvipes* and *Nezara* sp. Brief notes on the bionomics of this Mantid are given.

Newman (L. J.). *Aphelinus mali*.—*Jl. Dept. Agric. W. Australia*, iii, no. 4, pp. 486-487, 3 figs. Perth, W. A., December 1926.

In view of the results obtained with *Aphelinus mali*, Hald., in Australia against the woolly aphid [*Eriosoma lanigerum*, Hausm.] a test has

been made in Western Australia to determine how this parasite would operate against the black citrus aphid, here recorded as *Siphonophora* sp. [cf. R.A.E., A, xiv, 206]. Colonies of the parasite were therefore introduced into an orchard infested with this pest, and the trees were left unsprayed. For the first year the parasite did not seem to make much headway, but later it was found that the outbreak had entirely subsided and that practically every Aphid had been parasitised. From these trees many colonies of the parasite have been distributed, and should the same results occur generally, its value will be greatly enhanced.

NEWMAN (L. J.). **Fruit Fly** (*Ceratitis capitata*). **Trapping or Luring Experiments.**—*Jl. Dept. Agric. W. Australia*, iii, no. 4, pp. 513-515, 5 figs. Perth, W.A., December 1926.

The experiments recorded were undertaken to prove the effectiveness of trapping the overwintering females of *Ceratitis capitata*, Wied. During the period from 2nd May to 23rd November, 8,200 flies were captured by this method, the bait recommended being composed of 8 oz. bran and 8 oz. powdered borax to 1 gal. of water. This should be mixed together thoroughly and steeped for several hours, then shaken well again and allowed to settle, when the clear liquid alone is used, the residue being discarded. Any tin that is shallow and has a marginal edge may be used, but the one found most convenient was a petrol tin cut down to  $\frac{1}{4}$ -size, with an edge of 1 in. turned in all round. The traps should be renewed once a week in hot dry weather and every 10 days in winter. To obviate the danger of emptying any living flies out of the tins, these should be tipped into a bucket with a little kerosene in it. The records of captures showed an obvious falling off in the number of males as the winter advanced; after mid-July none was found in the traps, thus proving that it is the fertilised females derived from pupae of late May or early June that are chiefly responsible for carrying the infestation over to the following season. These flies shelter among the foliage of *Citrus* trees, and, if weather conditions are favourable, a few *Citrus* or loquat fruits may be attacked and a winter generation of maggots reared. These maggots develop slowly and, if they survive, will emerge as early summer flies. The conditions that influence the abundance of the pest most, however, are the food supply and climatic conditions after September. Bait sprays should still be applied to the foliage from September to May, followed by the co-operative use of traps for the winter months.

NEWMAN (L. J.). **Codlin Moth** (*Carpocapsa pomonella*).—*Jl. Dept. Agric. W. Australia*, iii, no. 4, pp. 531-534, 3 figs. Perth, W.A., December 1926.

Since the introduction into Western Australia of *Cydia* (*Carpocapsa*) *pomonella*, L. (codling moth) in 1903, there have been ten outbreaks of the pest there, all of which have been subdued. A further outbreak is at present occurring, and every effort should be made to deal with it promptly. The distinguishing marks of infested fruit are described, and it is suggested that the fruit should be given a thorough protective covering of lead arsenate.

BENTON (R. J.). **Fumigation of Citrus Trees. The 1926 Trials with Calcium Cyanide.**—*Agric. Gaz. N.S.W.*, xxxviii, pt. 1, pp. 77–80. Sydney, January 1927.

Experiments with calcium cyanide dust on *Citrus* trees carried out in New South Wales in May and June, 1926, indicate that the dosage for orange trees must not be less than the quantity recommended in Allen's revised No. 2 table [*R.A.E.*, A, i, 502], substituting calcium cyanide for potassium cyanide; that the distribution of the dust by hand is not as effective as by a machine blower, and that any less exposure than 45 minutes when using the No. 2 dosage is not advisable. The experiments were carried out on trees infested with red scale [*Chrysomphalus aurantii*, Mask.], and from 98 to 98.9 per cent. mortality was obtained. It is thought that this would have been even higher if the tents had remained five minutes longer over the trees, or if the dose had been slightly increased. A somewhat higher mortality was obtained on fruits that had been wetted before fumigation, but much more scorching is likely to occur by fumigating when dew is on the trees. The damage to trees in the present experiments (temperatures ranging from 48° to 69° F., and humidity from 42 to 82 per cent.) consisted of moderate leaf fall, which generally occurred on the part of the tree that was continually receiving the blast from the blower. Tests on lemon trees have not been made on a large scale, but apparently a good deal of scorching and defoliation occur when a machine blower is used. When, however, the dust (using 200 per cent. dosage) was sprinkled on the ground beneath the tented tree, excellent results were obtained.

COLEMAN (F. F.). **Pests of Stored Seeds and their Control.**—*Queensland Agric. Jl.*, xxvii, pt. 1, pp. 13–14. Brisbane, 1st January 1927.

This is an extract from the Annual Report of the Department of Agriculture and Stock, Queensland, for 1925–26. About one-third of the samples of cowpea seeds examined were infested with *Bruchus* sp.; injury by this pest can be avoided by fumigating the seed soon after threshing and then storing it in insect-proof containers, such as tanks. For fumigation, 4 oz. carbon bisulphide to 100 cu. ft. of space has been found to be sufficient, so 3 oz. is required for a round 500 gallon-tank having a capacity of about 75 cu. ft. The tank should be filled with cowpeas, with some cotton waste on top; the carbon bisulphide should then be poured on to the cotton waste and the tank immediately closed with an airtight lid. The seed should remain in the tank for not less than 24 or more than 30 hours. Several seed merchants found it necessary to fumigate lucerne seed in this way, on account of infestation by *Bruchophagus funebris*, How., and it is pointed out that this Chalcid should be controlled on the farm; it is advisable not to save seed from infested fields, and all debris left from threshing lucerne should be burnt, as it often includes broken pods containing seeds infested by the hibernating larvae.

FROGGATT (J. L.). **Dusting with Calcium Cyanide for Banana Thrips Control.**—*Queensland Agric. Jl.*, xxvii, pt. 1, pp. 67–72. Brisbane, 1st January 1927.

Preliminary trials with calcium cyanide for the control of *Anaphothrips signipennis*, Bagn. (banana thrips) showed that this material

gave better results than sulphur or pyrethrum powder, which were previously recommended. Further experiments were made in October and November on a larger scale on two plots, one of which consisted of stools bearing a good crop of fruit and the other of young stools mostly not in bearing. Each plot was divided into three sections, and two rows of ten stools on each were used as controls. All the remaining rows of each section were dusted with calcium cyanide "A" dust [*R.A.E.*, A, xiv, 74], applied to the stems and bunches with a hand bulb-blower at the rate of 1 lb. to about 250 stools; in dusting the stem each lower leaf-sheath was drawn away slightly so that the dust penetrated well towards the base. The dust should be applied to the fruit as a cloud, since a coating of dust on the fruit is injurious on account of the quick-lime residue that is left after the hydrocyanic acid gas has been evolved. In addition to the dusting two sections of each plot received soil treatments, one with calcium cyanide flakes and the other with paradichlorobenzene, at the rate of  $\frac{1}{2}$  oz. to each stool, buried at a depth of 3-4 ins. about 6 ins. from the base of the plant, to control the nymphs. Three treatments and a final examination were made at intervals of 7-10 days, and thrips were not generally numerous on any of the treated sections, while on the untreated rows colonies, often large, were found on almost every stool and bunch of fruit. The sections that received soil treatment gave somewhat better results than those that were only dusted, calcium cyanide flakes being slightly superior to paradichlorobenzene. The cost of materials for 100 stools for each treatment was about 9½*d.* for calcium cyanide "A" dust, 5*s.* for calcium cyanide flakes and 4*s.* 8*d.* for paradichlorobenzene. One operator should be able to treat about 50 stools an hour dusting, or rather fewer with soil treatment as well. Applications should be made at intervals of not more than three weeks, the first being made as soon as the flower-bracts lift off the hands on the young bunch, or even a little before the bunch is thrown. Dusting, even without soil treatment, will give a good measure of control.

JARVIS (E.). **Annual Report of Entomologist, 1925-26.**—*Queensland : 26th Ann. Rept. Bur. Sugar Expt. Stas.*, pp. 19-23. Brisbane, December 1926.

The greater part of this report is taken from the monthly reports of the Division of Entomology and has already been noticed. The Noctuid, *Cirphis irregularis*, Wlk., was reared from larvae on sugar-cane in company with *C. loreyi*, Dup., and larvae of the Lymantriid, *Anthela acuta*, Wlk., were found feeding on sugar-cane leaves in one locality.

MUNGOMERY (R. W.). **Report of the Assistant Entomologist, Southern Division of Entomology, January-October 1926.**—*Queensland : 26th Ann. Rept. Bur. Sugar Expt. Stas.*, pp. 24-26. Brisbane, December 1926.

An entomological laboratory for the sugar-cane area of Southern Queensland was established at Bundaberg early in 1926, and the author investigated the pests of the southern cane-fields. The most

serious pests, as in North Queensland, are the root-feeding Lamellicorn larvae, of which the most important are the Melolonthids, *Lepidoderma albohirtum*, Waterh., which is confined to the northern part of the area, *Lepidiota frenchi*, Blackb., and an unidentified species, and the Dynastid, *Pseudoholophylla furfuracea*, Burm. The author's reports on the districts visited have been noticed [*R.A.E.*, A, xiv, 331, etc.]. Minor pests not mentioned in these reports included the Elachistid leaf-miner, *Cosmopteryx dulcivora*, Mevr., and the Lygaeid, *Phaenacantha australica*, Kirk., in the northern district, where, with *Lepidoderma albohirtum*, they probably reach the southern limit of their distribution, and the Dynastids, *Dasygnathus australis dejeani*, MacL., and *Anoplognathus boisduvali*, Boisd.

LEA (A. M.). **South Australian Plant Weevils.**—*Jl. Dept. Agric. S. Australia*, xxx, no. 6, pp. 582-598, 27 figs. Adelaide, 15th January 1927.

A general description of weevils and their habits is followed by brief notes on some of the genera, illustrated by those particular species that are injurious to growing plants in South Australia. The species mentioned include: *Leptops robustus*, Oliv., and *L. rhizophagus*, Lea, the larvae of which attack the roots of apple trees; *Otiorrhynchus cribricollis*, Gyll., which is the most destructive species in South Australia, damaging the roots (in its larval stage) and eating the leaves and bark of twigs of numerous fruit trees, vegetables and other plants, a list of which is given; *O. sulcatus*, F., which feeds in a similar manner on peas, beans, apple, etc.; *Polyphrades longipennis*, Pasc., which damages the tips of apple twigs (though the genus lives chiefly on *Eucalyptus*); *Orthorrhynchus cylindrirostris*, F., which is probably the commonest and most widely distributed species of plant weevil in Australia, the larvae attacking the roots and boring into the trunks, and the adults nibbling the bark, leaf and flower buds of *Eucalyptus*, *Acacia*, orange, apple, peach, apricot, and grape; *O. klugi*, Boh., which occurs on apple and grape-vine more commonly than on orange, and in some years damages roses and passion vines [*Passiflora edulis*]; *O. aethiops*, Boisd., which damages the bark and buds of fruit trees, roses, etc.; *Belus* spp., which live chiefly on *Acacia* and *Eucalyptus*, but sometimes attack orchard trees, the larvae occasionally boring into apricot and other stone-fruit trees, *B. suturalis*, Boisd., being probably the most injurious species in South Australia; *Listroderes obliquus*, Gyll. (*Desiantha nociva*, Lea), which injures tomatos and other vegetables, and apricot trees; *D. maculata*, Blackb., which feeds on a great variety of plants, including fruit trees, vegetables and grape-vines; *Mandalotus crawfordi*, Blackb., and *M. avenaceus*, Lea, which feed on cereals; *M. interocularis*, Lea, which lives on grasses and lucerne; *Homoeotrachelus australasiae*, Faust, which attacks several species of wattle [*Acacia*] and fruit trees; *Neomerimnetes destructor*, Blackb., which naturally feeds on shrubby plants, but occasionally attacks strawberry plants in large numbers; *Geosomus macleayi*, Faust, which is rare but has been seen eating the shoots of apple trees; *Rhinaria perdix*, Pasc., which eats strawberry plants, while its larvae bore into the roots and stems; *Rhadinomus lacordairei*, Pasc., which lives on the leaves and twigs of *Eucalyptus* spp. and

other plants, including strawberries, the larvae boring in the stems of the latter ; *Gonipterus scutellatus*, Gyll., which occurs almost exclusively on *Eucalyptus* spp., though it sometimes attacks apple ; and *Ethemaia sellata*, Pasc., which feeds on *Eucalyptus* and occasionally on fruit trees, shrubs and vines.

*Prosyleus comosus*, Germ., and *Desiantha caudata*, Pasc., which are usually found on grasses, are recorded from New South Wales as attacking the foliage of fruit trees, *P. comosus* also occurring on shade trees, vines and young plants.

No effective remedy is known against root-infesting larvae, but *Rhadinosomus lacordairei* and *Rhinaria perdix* may be prevented from attacking very young strawberry plants by placing some coarse ground tobacco or hellebore in the holes in which they are set out. In one case *Otiorrhynchus cribricollis* attacking apple trees was caught in large numbers in small circular troughs made in two parts to encircle the trees and nearly filled with crude oil. Arsenical sprays used against the codling moth [*Cydia pomonella*, L.] are effective against the adults, but should be increased in strength. Tin or cardboard rings tacked round the trunks of trees so that the lower edge projects a few inches may prevent the wingless, night-moving species from climbing the trees. Rings of sheepskin with the wool, or of cotton wool, have been used with good results to trap the weevils, or they may be beaten from the trees.

**Bunchy Top in Bananas. The Nature of the Disease and the Measures recommended for its Control.**—*Agric. Gaz. N.S.W.*, xxxvii, pts. 8 & 9, pp. 603–612 & 697–705, 9 figs. Sydney, August & September 1926.

This is the final report of the Bunchy Top Investigation Committee under the supervision of E. J. Goddard, of which the preliminary report has been noticed [*R.A.E.*, A, xiv, 95]. It is considered that the spread of bunchy top in bananas in north-eastern New South Wales and south-eastern Queensland has been due primarily to the propagation of infested suckers over wide areas and secondarily to transmission by *Pentalonia nigronervosa*, Coq. (banana aphid). Investigations have not shown any plant other than those of the genus *Musa* to be a positive host of bunchy top, nor has any species of this genus grown in Australia proved resistant to it. In view of the nature of the disease, which is of the virus type, and the habits of the transmitting Aphids, which occur in numbers in the soil near the corms and shelter within the old leaf-sheaths at the base of the pseudostem, spraying is considered to be quite ineffectual. No remedial measures are available, and the only solution to the problem seems to be the eradication of all stools affected with bunchy top, the exclusion of the disease from unaffected areas, its control in lightly infested areas, and the rehabilitation of heavily infested areas where banana-growing has almost been abandoned. As the incubation period of the disease is one month, an apparently healthy sucker may be infected if it has been obtained from the vicinity of an infected area. It is therefore suggested that a Government nursery should be established in some part of Queensland that is free from bunchy top, for the supply of reliable healthy suckers at a reasonable price. A number of other recommendations are put forward by the Committee for the consideration of the Government.

BRITTIN (G.). **Observations on the New Zealand Species of the Genus** *Poliaspis*.—*N.Z. Jl. Sci. & Tech.*, viii, no. 5, pp. 287–288, 4 refs. Wellington, N.Z., September 1926. [Recd. March 1927.]

The Coccid genus *Poliaspis*, the characters of which are discussed, is represented in New Zealand by *P. media*, Mask., and *P. argentosis*, Brit., though there is some doubt as to whether these are specifically distinct. They are found on a variety of different food-plants.

SIMMONDS (H. W.). **Report by the Acting Government Entomologist.**—*Fiji Dept. Agric. Ann. Rept. 1925*, pp. 7–9. Suva, 1926. [Recd. February 1927.]

A more recent account of the situation respecting *Levuana iridescens* has already appeared [*R.A.E.*, A, xiv, 431].

The eggs of *Acritocera negligens* (coconut spathe borer) have been found at the bases of the leaves, so that the larva must travel a long way to reach the flower spathe on which it feeds. The cutworm, *Prodenia litura*, does much damage to garden seedlings and to the lower surface of banana leaves; a Hymenopterous egg parasite was numerous. *Heliothis obsoleta* (tobacco worm) is apparently kept in check in Fiji by an unidentified species of *Apanteles*. Two other hitherto unrecorded species of *Apanteles* were observed, one bred from pupae of *Agonoxena argaula* (small coconut leaf moth), the other obtained from cotton bolls infested with *Platyedra gossypiella*. The fruit-fly, *Dacus passiflorae*, was present on *Capsicum* but was scarce, probably owing to the unusually heavy rains. Other pests were *Sylepta derogata* on *Hibiscus*, *Cylas formicarius* (sweet potato weevil), which caused much damage, *Nacoleia octosema* (banana scab moth), *Icerya seychellarum* on *Citrus*, and *Aspidiotus destructor* (coconut scale).

WHITNEY (L. A.). **Report of the Division of Plant Inspection, September–November 1926.**—*Hawaiian Forester & Agric.*, xxiii, no. 4, pp. 153–156. Honolulu, 1926. [Recd. February 1927.]

The pests intercepted include: From California, *Pseudococcus maritimus*, Ehrh., on fresh quinces and pears, *P. citri*, Risso, on *Coleus*, *Aspidiotus hederæ*, Vall., on persimmon, Membracids on strawberry plants, *Aegeria rutilans*, H. Edw., in raspberry plants, *Pseudococcus adonidum*, L. (*longispinus*, Targ.), on dahlia cuttings, *Reticulitermes hesperus*, Banks, in wood embedded in the soil round the roots of *Citrus* stocks, *Pheidole* sp., and *Porcellio laevis*, Latr., in the soil around the roots of *Citrus* stocks, and *Saissetia oleæ*, Bern., on pears; from New Jersey, *Pseudococcus maritimus* on *Aglaonema* and *Eupatorium*, and *Coccus* (*Lecanium*) *pseudohesperidum*, Ckll., on *Dendrobium*; from Kentucky, North Carolina and Tennessee, larvae of *Balaninus proboscideus*, F., in chestnuts; from Tahiti, *Saissetia* sp. on *Plumbago*; from Guam, *Pseudococcus* sp. on nipa palm seeds [*Nipa fruticans*] and *Monomorium* sp. and *Araecerus* (*Araecerus*) sp. in tree seeds; and from Japan, *Lecanium* sp. on *Croton*, *Pseudococcus* on *Ginkgo*, *Aralia* and sandpears [*Pyrus sinensis*, *P. comstocki*, Kuw., on *Euonymus*, *Bruchus chinensis*, L., in beans, and *Calandra* (*Sitophilus*) *oryzae*, L., in rice cakes.

SMALL (W.). **Matters of Phytopathological Interest during 1926.**—*Yrbk. Dept. Agric. Ceylon, 1927*, pp. 7–10. Peradeniya, 1927.

The general soil and climatic conditions in Ceylon are favourable to *Heterodera radiculicola*, Greeff, and once this Nematode has become established in a nursery or garden it is very difficult to eradicate. It kills tea and coffee seedlings, as well as other plants such as brinjal [*Solanum melongena*], tomato, banana, and tobacco. Affected areas should be isolated by a narrow trench at least 2 feet deep, and the infested plants should be removed and burnt. All weeds should be inspected and any that contain galls on the roots should also be burnt. This process should be repeated several times and extended to include the planting of susceptible plants at intervals and their systematic removal when infested.

HUTSON (J. C.). **Some Notes on Tea Tortrix** (*Homona coffearia* Nietn.).—*Yrbk. Dept. Agric. Ceylon, 1927*, pp. 11–18, 1 pl., 9 refs. Peradeniya, 1927.

The life-history of *Homona coffearia*, Nietn., has been studied under laboratory conditions. The number of eggs laid by one individual varied from 2 to 710, over half the moths laying more than 200 eggs each. In most cases oviposition was completed by the end of the eighth day after emergence. The eggs are almost invariably laid on the upper surface of the leaves in masses, the older and harder leaves being preferred, and hatch in about 7 days.

In one experiment eggs laid in the insectary were allowed to hatch in a normal position on an uninfested bush. Some of the larvae migrated to the youngest leaves and settled down to feed within an hour, but others, which had remained on the older leaves, were carried by the wind as far as at least 3–4 bushes to leeward of their hatching point. Three weeks later it was found that only about 23 per cent. of the larvae had survived and that 86 per cent. of these were in the flush. In the ordinary course of events most of the young larvae in the flush would have been removed by plucking. Similar results were obtained in a second experiment. The average duration of the larval period is  $23\frac{1}{2}$  days for the male and 26 for the female; the pupal stage lasts 6– $7\frac{1}{2}$  days. Under field conditions the pupae are usually found in a nest of webbed leaves. The total period from oviposition to the death of the adults is between 5 and nearly  $9\frac{1}{2}$  weeks in the case of the males and 5–10 weeks in the case of the females [*cf. R.A.E., A, vi, 435*].

Additional food-plants mentioned [*R.A.E., A, vi, 540*] are cowpea (*Vigna catjang*), *Hibiscus esculentus* and coffee (*Coffea robusta*).

The various remedial measures that have been recommended from time to time are reviewed; the author considers that the collection of egg-masses should form part of a programme for concerted action by all estates and should be accompanied by the collection of the caterpillars.

JEPSON (F. P.). **A Preliminary Note on the Distribution of the Ceylon Tea** *Calotermes*.—*Yrbk. Dept. Agric. Ceylon, 1927*, pp. 19–21, 1 pl. Peradeniya, 1927.

A very brief account is given of the habits of termites infesting tea [*R.A.E., A, xi, 315*], and the present distribution of *Calotermes militaris*, *C. dilatatus* and *C. greeni* in Ceylon is discussed.

DE MEL (C. N. E. J.). **Notes on Pests and Diseases of Coconuts in the North-western Division.**—*Yrbk. Dept. Agric. Ceylon, 1927*, pp. 22-24. Peradeniya, 1927.

*Nephantis serinopa*, Meyr., is widely distributed in north-western Ceylon and causes considerable damage to coconuts in various localities. In some areas as much as 20-50 acres of palms have been injured, the infested area appearing brown in contrast to the green of the surrounding plantations. In most cases the injury was done before natural enemies had appeared in sufficient numbers to control the pest. Light traps at night are not of much value, as the moths attracted to them only include a small percentage of *N. serinopa*. The only satisfactory remedial measure is to cut the infested fronds or leaflets and burn them immediately. This is of value early in an infestation, but later, when the infestation is dying down, and parasitic control is efficient, it is better to let the parasites complete their work. Once the pest is well established, its complete eradication cannot be expected. It usually reappears in different localities at intervals of about 4 years, depending on climatic conditions, and the intensity of infestation and damage appears to work up to a climax at the end of 1-1½ years.

DE MEL (C. N. E. J.). **Notes on some Pests and Diseases of Plantains and Tobacco in the North-western Division.**—*Yrbk. Dept. Agric. Ceylon, 1927*, p. 30. Peradeniya, 1927.

The cultivation of bananas in north-western Ceylon has recently been checked by the occurrence of bunchy-top disease. It is transmitted in Australia by the banana aphid [*Pentalonia nigronervosa*, Coq.]; but though a wingless Aphid has been noticed in the Ceylon plantations, it has apparently not been very prevalent. The best measures are the destruction of affected plants and the avoidance of suspected material for planting.

Tobacco is attacked by *Heterodera radiculicola*, Greeff, and *Phthorimaea* (*Gnorimoschema*) *heliopa*, Lw. (tobacco stem borer). The latter oviposits on the stalk or rib of a leaf, and the larvae bore down the stalk into the stem, where they produce a swelling. Pupation occurs in the stem. The simplest measure is to remove and burn all badly attacked plants and all the old plants after the crop is gathered.

Soil fumigation with calcium cyanide has been suggested for the control of *H. radiculicola*, which attacks the roots and causes the plants to wilt. The use of trap-crops and crop rotation or the abandonment of an infested area for a year or more are alternative measures.

AUSTIN (G. D.). **Preliminary Notes on the Toxicity of some Standard Insecticides under Ceylon Conditions.**—*Yrbk. Dept. Agric. Ceylon, 1927*, pp. 49-53, 12 refs. Peradeniya, 1927.

Official recommendations of insecticides in Ceylon have usually been based on the results of work in other countries. As climatic and other factors may affect the efficiency of various materials, the author has started a series of investigations in order to determine the efficacy of certain stomach poisons under Ceylon conditions. The materials dealt with are lead chromate, various arsenicals and sodium fluosilicate. The insecticides were applied to the foliage of small twigs placed in phials of water so as to keep them fresh throughout the experiment. A number of different insects were allowed to feed on the leaves in the

laboratory. The time elapsing between feeding and any evidence of the effect of the poisons on the insects and their effect on the plants are described. The results are not yet conclusive, and it is proposed to continue the experiments in 1927 both in the laboratory and in the field.

DE ALWIS (E.). **Two Caterpillar Pests of the Dadap** (*Erythrina lithosperma* Bl.).—*Yrbk. Dept. Agric. Ceylon, 1927*, pp. 54–56, 2 pls. Peradeniya, 1927.

*Terastia meticulosalis*, Guen. (dadap shoot borer) is probably present in most districts where dadap is grown as a green manure crop in Ceylon. Under field conditions the eggs are laid singly on the base of the tender leaf-stalks, and only 2–3 on each shoot; they hatch in 7–8 days. The larvae bore into the tender undeveloped leaves and feed in them for 2 days, after which they bore downwards into the tender shoots. The attacked shoots die back. The larval stage lasts 29–33 days, and the pupal stage 15–18, the latter occurring below the frass that has accumulated at the apical end of the shoot. The entire period from oviposition to the death of the adults occupies from 57 to 69 days.

The usual practice of lopping the branches of dadap 2–3 times a year considerably reduces the numbers of this pest, but should it increase between the intervals of lopping, the attacked shoots should be cut off and destroyed. This also destroys a large number of *Agathodes ostentalis*, Hb. (dadap leaf-folder), which pupates in the empty galleries of *T. meticulosalis*. *A. ostentalis*, which mainly attacks the leaves of dadap, is not a serious pest. Under artificial conditions the eggs were scattered about on the sides of the breeding cages and on the leaves and stems and hatched in 5–6 days, the larvae migrating to older leaves where they fed within a fold. The pupal stage lasted 15–19 days, the period from oviposition to the death of the adults being 39–59 days.

CORBETT (G. H.). **Three New Aleyrodid on Coconuts in Malaya.**—*Malayan Agric. Jl.*, xv, no. 1, pp. 24–25, 2 pls. Kuala Lumpur, January 1927.

*Aleurocanthus gateri*, sp. n., *A. cocois*, sp. n., and *Dialeurodes* (*Gigaleurodes*) *simmondsi*, sp. n., are recorded in Malaya on the leaves of coconut, the first-named also occurring on African oil-palm [*Elaeis guineënsis*].

TAKAGI (G.). **Studies on the Methods for the Control of *Dendrolimus spectabilis*, Butl. (Lasiocampidae), 1.** [*In Japanese.*]—*Forest Expt. Sta.*, Rept. 2, 72 pp., 9 pls. Kojo, Korea, January 1925.

The larvae of *Dendrolimus spectabilis*, Butl., cause serious damage to pines in Korea. The adults appear from the end of July to the middle of August, emergence taking place at night. They are attracted to light, especially after oviposition. The females live 8 or 9 days and the males 6, each female laying 61–922 eggs in masses of usually 100–500. The larvae hatch in 4–10 days and are gregarious in the first instar, but not in the later ones. They hibernate in crevices on the stem, particularly on the basal part, or in sheltered places, from the beginning of

November until the end of the following March. Pupation begins about the middle of July, the moths emerging a fortnight later.

Egg parasites of this Lasiocampid are *Anastatus gastropachae*, Ashm., which appears in June, and *Holcacus* sp. and *Trichogramma* sp., which appear in August and destroy 30 and 26 per cent. of the eggs respectively. Parasites of the larvae are *Casinaria atrata*, Morley, which has 4 generations a year, destroying up to 71 per cent., *Rhogas* sp., and Tachinids of the genera *Masicera*, *Carcelia* and *Sarcophaga*. The pupae are parasitised by *Theronia japonica*, Ashm., and *Chalcis obscurata* Wlk., but these may also parasitise the pupae of *Casinaria atrata* as do *Pimpla* sp., *Epiurus* sp., *Calliephialtes* spp. and *Torymus* sp. A woodpecker also destroys the larvae. Collection of the cocoons and eggs and of the larvae in the winter is recommended. Various other remedial measures that have been adopted in Japan are reviewed in detail.

EGUCHI (M.). **On *Caradrina exigua* Hüb. (Noctuidae).** [*In Japanese.*]—*Rept. Agric. Expt. Sta. Korea*, no. 7, pp. 35–43. Suigen, Korea, February 1927.

*Laphygma (Caradrina) exigua*, Hb., causes great damage to sugar-beet and various other plants. In the west of Korea there are usually four generations a year, the adults first appearing in May. Each female lays 524–687 eggs in masses of about 30 on the lower surface of the leaves during 4 or 5 days after emergence. The females live 5 or 6 days longer than the males. The egg stage lasts 2–5 days, the larval stage about a fortnight and the pupal a week. The collection of the larvae and spraying with lead arsenate are recommended.

KANENO (K.) & KAMISHINA (S.). **Studies on preventing the Oviposition of *Chilo simplex*.** [*In Japanese.*]—*Jl. Plant Prot.*, xv, no. 2, pp. 77–83. Tokyo, February 1927.

Spraying with repellents against *Chilo simplex* did not prove of economic value. Nicotine sulphate and tobacco dust greatly reduce the percentage of hatching of the eggs and prevent the larvae from entering the rice stalks.

MURATA (J.). **On the Borers and Hoppers of the Rice Plant.** [*In Japanese.*]—*Jl. Plant Prot.*, xv, no. 3, pp. 134–146. Tokyo, March 1927.

*Chilo simplex* has two generations a year in most parts of Japan, but only one in the north of Honshu and in Hokkaido and three or four in Formosa. The larvae hibernate in the stumps or straws. The moths of the first brood emerge usually in the afternoon, and one female deposits 280 eggs in several masses, with an average of 52 in each. These are usually laid on the distal part of the upper surface of the leaf less than 1 inch from the apex, but, when the food-plant is more developed, on the lower surface as well. The larvae usually hatch in the morning, and when the plants are sufficiently mature to be attacked they soon bore into the stalks, but when the plants are too young they are dispersed by wind over the field. The larval stage lasts 24–60 days. The pupae are usually found 3 inches above the water surface, and this stage lasts 6–13 days, the moths appearing from the

end of July to the beginning of September. These moths lay fewer eggs than the first brood, but one egg-mass can contain more than 100 eggs; these are laid on the middle or basal part of the leaf. The general measures adopted in Japan are the collection of moths and eggs and the removal of infested stalks.

ARAKAWA (Y.). **Studies on Moths infesting Apples in Manchuria.** [*In Japanese.*].—*Manchuria & Mongolia*, 1927, pp. 1-46, 15 figs. Koshurei, Manchuria, February 1927.

In recent years in Manchuria 70 per cent. of the apple crop has been infested by moths, some of which appear to have been imported. The Tortricid, *Enarmonia prunivora*, Walsh, has two generations a year, the moths appearing at the end of May and again in August. The eggs are laid on the calyx or fruit, and the larvae hatch in 5-12 days and bore into the fruit. Those of the summer brood, which mature about a month after hatching, leave the apples to pupate in the crevices on the trees. The adults emerge 6-21 days later. The larvae of the second brood pass the winter in the 4th instar in the bark, and pupation occurs in April of the next year. Old trees are more infested, as crevices suitable for hibernation are common on the trunk. About 6 per cent. of the pupae are destroyed by *Chalcis* sp., the adults of which appear in August and September.

The Tineid, *Argyresthia conjugella*, Zell., has only one generation a year. Eggs are laid in sheltered places on the trees and hatch in about 5 days. The larvae bore into the fruits and are mature in about 60 days. They pass the winter in cocoons on the stems, under fallen leaves or in the soil. Pupation takes place in April, and the adults emerge at the end of May. From 5-20 larvae may be found in a single fruit.

The Tortricid, *Cydia (Laspeyresia) molesta*, Busck, may attack various kinds of *Prunus* and *Pyrus*. There are three generations a year. The full-grown larvae of the third generation hibernate in cocoons in sheltered places, and pupation occurs from the end of March to the beginning of April, the adults appearing in April or May. The Pyralid, *Nephopteryx rubrizonella*, Rag., has two generations a year, the adults emerging from the end of June to the middle of July and again from the end of September to the beginning of October. Hibernation occurs in the egg stage, which lasts 8 days in summer. The overwintering eggs hatch early in June, and the larvae spin the stalks of the apples or pears with the twigs to prevent the fruit from falling, and then bore into them. The pupal stage occurs in the fruit and lasts 5-10 days in summer. Another Tortricid, *Carposina sasakii*, Mats., also infests peaches, pears and apples. There are two generations a year, the adults appearing in May and June and again in August. The larvae begin to hibernate in cocoons in the soil in the beginning of October and pupate in the following April.

HALL (W. J.). **On a Small Collection of Coccidae from Palestine.**—*Bull. Soc. R. ent. Egypte*, xix (1926), pp. 107-109. Cairo, 1927.

Notes are given on six species of Coccids from Palestine, of which the three following are recorded for the first time from that country: *Pinnaspis zillae*, Hall, on *Calotropis procera* and *Osyris alba*; *Cocco-mytilus isis*, Hall, on *Tamarix*; and *Lepidosaphes intermittens*, Hall, on a grass.

HALL (W. J.). **On the Newly-hatched Larva of *Monophlebus gymnocarpi*, Hall.**—*Bull. Soc. R. ent. Egypte*, xix (1926), pp. 113–117, 1 pl. Cairo, 1927.

The author's previous description of *Monophlebus gymnocarpi*, Hall [*R.A.E.*, A, xv, 115], did not include that of the newly hatched larva, and as every stage is of importance for correct determination in this genus, the description is now given, though the characters of this stage make it uncertain whether the insect is correctly referable to the genus *Monophlebus*.

HALL (W. J.). **Notes on the Coccidae of the Eastern Desert of Egypt.**—*Bull. Soc. R. ent. Egypte*, xix (1926), pp. 118–177. Cairo, 1927.

In this preliminary study of the Coccids of the eastern desert of Egypt, 18 of the species dealt with appear to be limited to the desert, attacking only plants that are confined to it, while many others are recorded that have their natural habitat in the cultivated area but have managed to adapt themselves to desert conditions where suitable food-plants occur. A list is given of the food-plants, with the species known to attack them.

HALL (W. J.). **A Coccid new to Science from Mecca and two Records from Arabia.**—*Bull. Soc. R. ent. Egypte*, xix (1926), pp. 263–266, 1 fig. Cairo, 1927.

*Targionia meccae*, sp. n., is described from Mecca on *Zizyphus* sp., and *Parlatoria blanchardi*, Targ., and *Lecaniodiaspis africana*, Newst., are recorded for the first time from Arabia, the former on *Phoenix dactylifera* (date palm) and the latter on an unknown plant.

HALL (W. J.). **Miscellaneous Notes on Egyptian Coccidae with Descriptions of three New Species.**—*Bull. Soc. R. ent. Egypte*, xix (1926), pp. 267–280, 3 pls. Cairo, 1927.

The new Coccids described are *Phenacoccus gypsophilae*, on *Gypsophila rokejeka*; *P. hirsutus*, Green, var. *cressae*, on *Cressa cretica*; and *Trionymus euphorbiae* on *Euphorbia* sp. There are also one new record and notes on previously recorded species. This paper concludes the author's work on Egyptian Coccids [*R.A.E.*, A, xv, 115], the total number of species recorded by him being 127.

WILLIAMS (C. B.). **Destruction du ver rose dans les graines de coton en Egypte.**—*Bull. Union Agric. Egypte*, xxv, no. 178, pp. 51–56. Cairo, February 1927.

*Platyedra* (*Gelechia*) *gossypiella*, Saund. (pink bollworm) is the most serious cotton pest of Egypt, causing an annual loss of some 10 to 30 per cent. of the crop, or an equivalent of about £10,000,000. It is hoped that the infestation has now reached its maximum, for it does not seem to have intensified during the last 8 or 10 years. The development of remedial measures is traced from the beginning up to the year 1926, when over 130 ginning machines of the Simons or Delta type, which include devices by which the seed is brought in contact with metal surfaces heated by steam, have been established. The method of inspection that ensures the carrying out of these remedies

satisfactorily is explained. At present all sweepings of seed have to be burnt, but experiments are being made with a view to devising a machine that will treat these by heat very cheaply.

CHEVALIER (A.). **Sur un borer attaquant les caféiers en Guinée française.**—*Rev. Bot. app. & Agric. colon.*, vii, Bull. 66, p. 135. Paris, February 1927.

*Bixadus sierricola*, White, is reported from French Guinea as attacking coffee, especially *Coffea arabica*. The larvae bore into the trunk and principal roots in every direction, but their galleries do not extend for more than 16 inches from the point where the eggs were laid. They attack for preference unhealthy and neglected trees. Infested trees should be burnt to prevent the spread of the pest.

CAYLA (V.). **Le coton à Madagascar.**—*Agron. colon.*, nos. 109 & 110, pp. 1-12 & 57-60. Paris, January & February 1927.

Cotton is not grown to any extent in Madagascar, the natives merely producing enough for their own wants. Some of the settlers that have attempted its cultivation have found their crops severely injured by *Platyedra* (*Gelechia*) *gossypiella*, Saund. (pink bollworm), *Earias insulana*, Boisd., and a number of unidentified bugs, which chiefly damage the young capsules. The possibilities of cotton-growing in the Island are, however, far from negligible, though the labour and transport difficulties are great.

NONELL COMAS (J.). **La lucha contra la mosca de la aceituna (*Dacus oleae*).** [Work against the Olive Fly.]—*Bol. Estación Pat. veg.*, i, no. 4, pp. 137-139. Madrid, December 1926. [Recd. March 1927.]

Biological control of *Dacus oleae* has not proved successful as yet in Catalonia, *Opius concolor* having failed to establish itself. This parasite has been imported again, and batches of *O. africanus* from Cape Colony are expected.

In experiments with bait-sprays some branches on the southern sides of the trees were sprayed with water 100 gals., glucose 100 lb., and sodium arsenite  $1\frac{1}{2}$  lb., while the treatment was completed by spraying the remaining parts of the trees with a 1 per cent. Bordeaux mixture. The infestation on treated trees was 2 per cent.; that on untreated ones 45 per cent. The Bordeaux spray is considered important as it is believed to repel the fly.

RODRÍGUEZ (J. A.). **El "gusano" de las azufaias (*Carpomyia incompleta* Becker).** [The Jujube Maggot.]—*Bol. Estación Pat. veg.*, i, no. 4, pp. 140-143, 3 figs., 3 refs. Madrid, December 1926. [Recd. March 1927.]

*Zizyphus sativa* (jujube) is grown at Ciudad Real as an ornamental tree and for its fruits. Since 1925 the latter have been increasingly attacked by the Trypetid, *Carpomyia incompleta*, Becker. The newly-formed fruits are infested by the larvae, which feed on the mesocarp. In July pupae were observed inside the fruits, the adults emerging after a pupal period of about a fortnight. This fly has been

recorded in *Zizyphus* spp. from the Sudan, Eritrea, and Italy. The measures suggested are a bait-spray as used for *Dacus oleae* and the destruction of the larvae in infested fruits.

DEL CAÑIZO (J.). **Mezcla de insecticidas y criptogamicidas.** [The Mixture of Insecticides and Fungicides.]—*Bol. Estación Pat. veg.*, i, no. 4, pp. 147-149, 1 fig. Madrid, December 1926. [Recd. March 1927.]

This is a short note on the method of combining insecticides with fungicides, showing the sprays that are compatible and incompatible. Suitable formulae are given.

**Trabajos de las Secciones provinciales del Servicio Agronómico Nacional relativos a plagas del campo en el año 1926.** [Work against Agricultural Pests in 1926 by the Provincial Sections of the Spanish National Agronomical Service.]—*Bol. Estación Pat. veg.*, i, no. 4, pp. 150-163. Madrid, December 1926. [Recd. March 1927.]

Notes are given on the insect pests on which work was done in the various provinces of Spain in 1926.

Olive pests included *Phloeotribus scarabaeoides*, *Dacus oleae*, *Phloeothrips oleae*, and *Saissetia oleae*. Grape-vines were injured by *Haltica ampelophaga* and the vine-moths, *Polychrosis* and *Clysia* (*Conchylis*). *Citrus* was attacked by *Ceratitis capitata* and *Chrysomphalus dictyospermi*, apples by *Hyponomeuta malinellus* and *Cydia* (*Laspeyresia*) *pomonella*, and cherries by *C. (L.) funebrana*. Potatoes were infested by *Tetranychus telarius*, and melons by *Epilachna chrysomelina*. *Aglaope infausta* caused considerable damage to almonds. Lucerne was infested by *Colaspidema atrum*. Locusts included *Calliptamus italicus*, *C. italicus* var. *marginellus*, and *Dociostaurus maroccanus*.

In the Canary islands peaches were infested by *Ceratitis capitata*, bananas by *Pseudococcus comstocki*, and potatoes by *Phthorimaea operculella*. The Coccid, *Icerya purchasi*, was observed for the first time.

BLISS (A. J.). **The Daffodil Fly.**—*Gard. Chron.*, lxxx, no. 2087, pp. 506-507. London, 25th December 1926.

As a result of experiments in which *Narcissus* bulbs were exposed to the attack of *Merodon* in one year and protected the next, the author concludes that two forms or species of the fly occur, in one of which the larval life is completed in a single year, while the other has a two-year cycle. The second form is the more destructive, as the first does not completely destroy any but quite young bulbs. He also gives a table showing the various named colour varieties of the flies taken in his grounds from 1914 to 1920, and concludes from the relative numbers that if two species are represented they are *M. equestris*, F., and *M. narcissi*, F., the other forms being a different sex or variety of one or other of these species, or hybrids between them.

The larvae of *Eumerus strigatus*, Fall., and *E. tuberculatus*, Rond., only attack bulbs injured by some other cause, usually *Merodon*.

PÉNEAU (J.). *Trama caudata* del Guercio.—*Bull. Soc. Sci. nat. Ouest France*, (4), vi, no. 1-4, p. xi. Nantes, 1926.

*Trama caudata* lives on the roots of lettuce, chicory, salsify and similar plants. Near Angers it is associated with and protected by the ant, *Lasius mixtus*.

PÉNEAU (J.). *Sur Rhizoglyphus echinopus*.—*Bull. Soc. Sci. nat. Ouest France*, (4), vi, no. 1-4, pp. vi-vii. Nantes, 1926.

Infestation of lily bulbs by *Rhizoglyphus echinopus* at Angers is recorded. This mite also attacks potatoes, vines, cereals, dahlias and other flowering plants. Soaking the bulbs in tobacco water or immersing them for about three hours in water at 43° C. [109.4° F.] is suggested.

KOWALSKI (J.). *A propos de quelques Insectes trouvés dans un parquet de chêne*.—*Bull. Soc. Sci. nat. Ouest France*, (4), vi, no. 1-4, pp. 27-37, 1 ref. Nantes, 1926.

*Bostrychus capucinus*, L., is recorded from oak flooring in Vendée. The eggs of this beetle are laid in early summer on the surface of dead wood, preferably oak, and the larvae bore in the wood. After about 11 months pupation takes place in the mines, and the adult eats its way out in May or June.

Another beetle found infesting the same timber was *Lyctus linearis*, Goeze, and it appears certain that the wood was already infested when placed in position.

GLODEN-SCHENGEN (N.). *Zur Bekämpfung des Wurms mit Nikotin*. [A Note on the Control of Vine-moths with Nicotine.]—*Luxemburger Weintzg.*, xv, no. 5, pp. 41-43. Grevenmacher, 26th February 1927.

Nicotine sprays have proved excellent in Luxemburg against the second generation of the vine-moths [*Clysia ambiguella*, Hb., and *Polychrosis botrana*, Schiff.]. The minimum effective strength of pure nicotine is 1.5 per mille. The nicotine can be used with Bordeaux mixture but is better in water containing  $\frac{1}{2}$  per cent. soft-soap.

HÄHNE (H.). *Ein Versuch zur Bekämpfung der Rübenaskäfer mit arsenhaltigen Ködern*. [An Experiment in combating Beet Silphid Beetles with Arsenical Baits.]—*Anz. Schädlingssk.*, iii, no. 3, pp. 25-29. Berlin, 15th March 1927.

Measures against the Silphid, *Blitophaga opaca*, L., on beet in Pomerania [*R.A.E.*, A, xiii, 395] include the use of poison-baits. The author's experiments with the latter in the summer of 1926 were based on the fact that the adults and larvae seek refuge under plants thrown on the ground when thinning is in progress. Such plants were collected, dipped in a solution containing 5 per cent. raw sugar and 0.5 per cent. of either sodium arsenite or sodium arsenate, and then thrown in small heaps over the beet field. The arsenate is quite effective, but is slower in action than the arsenite. These baits act more quickly and

have a more lasting effect, especially in rainy weather, than dust insecticides, at about the same cost for the materials. The method is suitable only when the plants are being thinned; and if the bulk of the larvae appear after thinning, a dust insecticide should be used.

ZACHER (F.). **Eine neue Gewächshausheuschrecke.** [A new Greenhouse Grasshopper.]—*Anz. Schädlingssk.*, iii, no. 3, pp. 33–34. Berlin, 15th March 1927.

Most of the Orthoptera hitherto recorded from greenhouses in Germany are phytophagous, but the Tettigoniid, *Tachycines asynamoros*, Adel., is chiefly carnivorous, though it may occasionally cause serious loss, particularly by attacking seedlings. An allied species, *Chopardina importata*, Uv., has been described from greenhouses in England [*R.A.E.*, A, ix, 504]. Since 1924 another grasshopper, *Phlugiola redtenbacheri*, Karny, appears to have become established in the greenhouses in the Berlin Botanical Garden, only females being observed, so that reproduction is probably parthenogenetic.

WEGSCHEIDER (J.). **Eine Lärchenerkrankung auf grösserer Fläche.** [A Disease of the Larch on a large Area.]—*Sudetendeutsche Forst-u. Jagdztg.*, no. 20, October 1926. (Abstract in *Anz. Schädlingssk.*, iii, no. 3, p. 35. Berlin, 15th March 1927.)

Injury to the crowns of larches in Bohemia was traced to the attack of the mite, *Tetranychus ununguis*, Jac., followed by an infection of the infested needles by a fungus, *Cladosporium* sp. The mite causes the needles to curl and turn red, while the fungus gives rise to an appearance resembling witch's broom. This is the first record of *T. ununguis* from larch.

PRELL (H.). **Eine mediterrane Bockkäferart als Lagerschädling in Deutschland** (*Leptidea brevipennis*, Muls.). [A Mediterranean Cerambycid Beetle, *L. brevipennis*, as a Warehouse Pest in Germany.]—*Mitt. Ges. Vorratsschutz*, iii, no. 2, pp. 21–22. Berlin, March 1927.

In 1923 a cotton-mill in Württemberg was suddenly infested by a Cerambycid beetle, *Leptidea brevipennis*, Muls. The adults had gnawed the yarn, and the infestation was traced to the baskets of unbarked osiers in which the cotton had been shipped and which had become infested either in Egypt or in transit through South Europe.

ANDRES (A.). **Der rundköpfige Reismehlkäfer** (*Latheticus oryzae*, Wat.) in Aegypten. [*L. oryzae* in Egypt.]—*Mitt. Ges. Vorratsschutz*, iii, no. 2, pp. 23–24. Berlin, March 1927.

*Latheticus oryzae*, Waterh., occurs in Egypt in the open and in warehouses, where it infests flour and flour products damaged by other pests. It occurs in nature in various parts of Egypt, development taking place in rotten wood or beneath bark. Some specimens were bred from *Albizia lebbek*.

WERTH (E.) & others. **Krankheiten und Beschädigungen der Kulturpflanzen in den Jahren 1922-1924.** [Diseases and Injuries of Cultivated Plants in 1922-1924 in Germany.]—*Mitt. biol. Reichsanst. Land- u. Forstw.*, no. 30, 400 pp. Berlin, February 1927.

This report contains extensive annotated lists of the insect pests recorded in Germany from 1922 to 1924, divided according to the class of crop attacked.

SPEYER (W.). **Von der Bekämpfung des Apfelsaugers an der Niederelbe.** [On the Control of the Apple Sucker on the Lower Elbe.]—*Nachrichtenbl. deutschen Pflanzenschutzdienst*, vii, no. 3, pp. 25-27. Berlin, March 1927.

The spray campaign planned for 1926 against *Psylla mali*, Schm., in the districts on the Lower Elbe [*R.A.E.*, A, xiv, 110] took place under police regulations in March, a proprietary lime-sulphur being used almost exclusively, and about 6 gals. being needed for an apple tree of normal size. A motor-sprayer can treat about two acres an hour. Owing to various circumstances the results were not conclusive, but the lime-sulphur showed more killing power in laboratory tests than in field tests. The reverse was the case with various brands of carbolineum, which were only used on a small scale, and this is given as an alternative to lime-sulphur in the revised regulations issued in November 1926.

**Amtliche Pflanzenschutzbestimmungen.** [Official Regulations on Plant Protection.]—*Nachrichtenbl. deutschen Pflanzenschutzdienst*, Beilage no. 9, pp. 149-164. Berlin, 1st March 1927.

The German regulations against *Psylla mali*, Schm., and the Colorado potato beetle, *Leptinotarsa decemlineata*, Say, are some of the measures recorded in this issue.

BRUHM (A.). *Lecanium aceris*, Bouché.—*Tharandter forstl. Jahrb.*, lxxvii, no. 2, p. 64. Berlin, 1927.

A severe infestation of maple saplings in Germany by *Lecanium aceris*, Curt., was successfully controlled by spraying with a 5 per cent. solution of fruit-tree carbolineum immediately before the leaves began to appear.

BLUNCK (H.). **Der Stand der Rübenfliegenfrage im Jahre 1926.** [The Position of the Beet Fly Question in 1926.]—*Deutsche Zuckerind.*, 1927, no. 1, reprint, 4 pp. Berlin, 1927.

Although it is true that late-sown beet remains free from attack by the beet-fly [*Pegomya hyoscyami*, Panz.], it is necessary to sow early in North Germany, owing to the losses in weight and sugar-content consequent on late sowing [*cf. R.A.E.*, A, xv, 110]. Infestation depends largely on the date of thinning, for if this is done during the oviposition period the eggs will be concentrated on the plants that are left. Thinning should be done immediately oviposition is over, and should be completed as quickly as possible, as pupation follows oviposition in 2-3 weeks. Careful cultivation and manuring are important factors in promoting rapid growth during the time that the beet is in the

susceptible early stages. The results obtained with bait-sprays have already been recorded [*R.A.E.*, A, xiv, 376; xv, 205]. The spray containing sodium fluoride has proved completely effective against the second and third generations of the fly, but further tests are necessary as regards its attractiveness for first generation flies and its effect on young beet plants.

[VUKASOVIĆ (P.). Вукасовић (П.). **Entomophagous Insect Parasites and their Importance in Agriculture.** [In Serbian.]—*Acta Soc. ent. Serbo-Croato-Slovenae*, i, pt. 1, pp. 61–67. Belgrade, 1926. (With a Summary in French.) [Recd. March 1927.]

This is a discussion on parasitic and predacious insects and their employment in biological control. The author considers that the general problems of the introduction of exotic parasites have been fully studied, but that more work with regard to the possibility of increasing the effectiveness of indigenous ones is desirable.

BRAGINA (A.). **Parasites of *Cydia pomonella*, L., near Belgrade.** [In Serbian.]—*Glasnik Centralnog Higijensk. Zavoda*, i, (ii), pt. 1–3, pp. 60–62, 1 pl. Belgrade, 1926. [Recd. April 1927.]

The parasites reared from *Cydia pomonella*, L., in the neighbourhood of Belgrade are *Trichogramma minutum*, Riley, from the eggs; *Asco-gaster carpocapsae*, Vier., from young larvae; a parasite variously identified as *Pristomerus vulnerator*, Grav., and *Bassus* sp., possibly *rufipes*, Nees, from older caterpillars; *Pimpla examinators*, Ratz., from pupae; a hyperparasite, *Diplazon laetatorius*, F., from larvae; and a Tachinid, *Arrhinomyia tragica*, Mg.

Other parasites recorded are *Orgilus* sp. from *Recurvaria nanella*, Hb.; *Angitia armillata*, Grav., and *Discochaeta euonymellae*, Ratz., from *Hyponomeuta malinellus*, Zell.; and *Pimpla pomorum*, Ratz., from *Anthonomus pomorum*, L.

[ЋОАКИМОВ (D.). Ћоакимовъ (Д.). **Injury by *Acantholyda* (*Lyda*) *erythrocephala*, L., and its Control.** [In Bulgarian.]—*Rev. Insts. Rech. agron. Bulgarie*, ii, no. 1–2, pp. 16–42, 15 figs. Sofia, 1921. (With a Summary in German, pp. 42–47.) [Recd. March 1927.]

*Acantholyda erythrocephala*, L., was unusually abundant during 1915–1917 in pine plantations at Küstendil (Bulgaria). This sawfly is not usually considered to be an important pest, and the actual causes of the outbreak are not known, though they undoubtedly included such factors as closely planted and thriving trees of *Pinus laricio austriaca* and *P. sylvestris* in pure stands, a comparatively mild climate, and the absence of natural enemies. Such conditions do not occur in natural forests on mountains.

The eggs, which are laid on the needles of young shoots, hatch in the second half of April or beginning of May. The larvae crawl towards the base of the needles, where they feed under cover of a silken web. The needles are only eaten at the base, the upper part being cut off and remaining in the nest. As the larvae crawl down the twigs in search of food, the nest is extended. Except in cases of very heavy infestation, the buds above the point of attack develop more or less normally. Owing to the absence of prolegs the larvae are unable to turn and ascend the tree. In one case, in which a four-year-old plantation of pines was very heavily infested, the larvae destroyed all the

leaves on the downward path and died on reaching the base of the trees, although abundant foliage had developed on the new shoots above. In the first half of June the larvae descend into the soil, where they remain through the winter. The pupal stage occurs in the soil in the following spring and lasts about 15 days, the adults emerging in March or April. Eggs are seldom laid on trees that have been attacked the previous year, vigorous trees being preferred.

The infestation was greatly reduced by allowing pigs to feed in the forest and by crushing the larvae in their nests. During 1917 about 20 per cent. of the larvae were parasitised by the Ichneumonid, *Holocremnus heterogaster*, Thoms. The infested larvae complete their development and enter the soil. The parasite leaves the dead host in the spring, and after a pupal period of 25–30 days the adult emerges.

[CHORBADZHIEV (P.).] **Чорбаджиев (П.). Notes on the Internal Parasites of Injurious Insects and their Practical Use.** [*In Bulgarian.*]—*Rev. Insts. Rech. agron. Bulgarie*, iii, pt. 1, pp. 84–86. Sofia, 1924. (With a Summary in German, pp. 87–88.) [Recd. March 1927.]

This is an annotated list of 21 insect parasites of Lepidopterous and Coleopterous pests observed in Bulgaria in 1923.

[CHORBADZHIEV (P.).] **Чорбаджиев (П.). Notes on unknown and little-known Pests in Bulgaria.** [*In Bulgarian.*]—*Rev. Insts. Rech. agron. Bulgarie*, iii, pt. 2–3, pp. 169–174. Sofia, 1925. (With a Summary in German.) [Recd. March 1927.]

Short notes are given on the life-history and control of various insect pests recorded from Bulgaria in 1924, including: *Eriophyes padi*, Nal., *E. phloeocoptes*, Nal., and *Putoniella marsupialis*, Lw., on plums; *Anomala aenea*, DeG., *A. vitis*, F., and *Scolytus amygdali*, Guér., on various fruit trees; *Oecanthus pellucens*, Scop., *Omophlus lepturoides*, F., and *Otiorrhynchus turca*, Boh., on vines; and *Tyroglyphus farinae*, DeG., and *Sitotroga cerealella*, Ol., attacking stored products.

[DRYENOVSKI (A. K.).] **Дръновски (А. К.). An Outbreak of Locusts in Sofia in 1919.** [*In Bulgarian.*]—*Rev. Insts. Rech. agron. Bulgarie*, iii, pt. 2–3, pp. 251–261, 7 refs. Sofia, 1925. (With a Summary in German.) [Recd. March 1927.]

An abstract of this paper has already been noticed [*R.A.E.*, A, xiv, 107].

[BURESH (I.).] **Бурешъ (И.). A Study of the Biology of *Polychrosis botrana*, Schiff., and its Control.** [*In Bulgarian.*]—*Rev. Insts. Rech. agron. Bulgarie*, iii, pt. 2–3, pp. 271–300, 2 figs., 29 refs. Sofia, 1925. (With a Summary in German.) [Recd. March 1927.]

This is an account of the life-history of the vine-moth, *Polychrosis botrana*, Schiff., in Bulgaria, where it has become increasingly abundant during the past 10 years. There are three generations a year, the adults appearing in May, July and August. The winter is passed in the pupal stage. Spraying with Paris green or tobacco extract is recommended.

[CHORBADZHIEV (P.).] Чорбаджиевъ (П.). [Reports of the Entomological Section for 1923 and 1924. (In Bulgarian.)]—*Rappts. ann. Inst. Rech. agron. Etat Sofia (Bulgarie)*, 1923 & 1924, pp. 99–109 & 167–185. Sofia, 1925. [Recd. March 1927.]

The work of the entomological section for the years 1923 and 1924 is reviewed. Many of the insect pests dealt with have already been noticed from another report [*R.A.E.*, A, xiii, 599].

[BEĬ-BIENKO (G. Ya.).] Бей-Биенко (Г. Я.). Notes on some Orthoptera from Palaearctic Asia. [In Russian.]—*Trans. Siberian Acad. Agric. & Forestry*, vi, no. 8, 13 pp., 3 figs. Omsk, 1926. [Recd. March 1927.]

*Gomphocerus sibiricus*, L., which inhabits the mesophytic grass-steppe zone of Western Siberia, occurs sporadically further north, but only in definitely xerophytic habitats. The northern limit of its distribution in Western Siberia is about 58° 18' north latitude.

[ZVEREZOMB-ZUBOVSKIĬ (E. V.).] Зверезомб-Зубовский (Е. В.). A Note on the Years of Outbreaks of Injurious Locusts on the Don. [In Russian.]—*Bull. N. Caucasian Plant Prot. Sta.*, no. 2, pp. 63–68, 68 refs. Rostov-on-Don, 1926. [Recd. February 1927.]

This is a compilation of data on the outbreaks in the Don province of *Locusta migratoria*, L., and of *Calliptamus italicus*, L., from 1830 to 1924, with a bibliography. A few records apply to *Acryptera microptera*, F.W., but the earlier ones pay little attention to this species.

[ZAKHAROV (L. Z.).] Захаров (Л. З.). The Reasons for the Outbreak of the Migratory Locust in the North Caucasian Region in 1926. [In Russian.]—*Bull. N. Caucasian Plant Prot. Sta.*, no. 2, pp. 90–102, 1 map, 14 refs. Rostov-on-Don, 1926. [Recd. February 1927.]

Enormous swarms of locusts [*Locusta migratoria*, L.] developed in 1925 in the usual breeding areas of the Northern Caucasus near the Caspian Sea. The autumn of that year was characterised by prevailing strong south-east winds, which caused the flying swarms to spread to the west and north-west. In the course of this migration some of the swarms settled and deposited their eggs in other usual breeding-places along the rivers and near the inland lakes, but the unusually high level of water in the river Kuma caused many of these places to be submerged at the time, so that some large swarms, which would have settled there, had to fly into adjoining steppes, and vast areas in the latter were infested with eggs. Normally these areas would have been bare of vegetation at this time, and quite unsuitable as breeding-grounds, but a study of the actual conditions at the time revealed an abnormal development of grasses owing to the year having been unusually rainy. In the spring of 1926 large numbers of locust larvae emerged in all these places, and the flying swarms first migrated eastwards, owing to prevailing west winds, but later on spread all over the Northern Caucasus.

[ZAKHAROV (L. Z.).] Захаров (Л. З.). **The Results of the Autumn Registration of Breeding Grounds of *Locusta migratoria*, L., in the Territory of the Northern Caucasus.** [In Russian.]—*Bull. N. Caucasian Plant Prot. Sta.*, no. 2, pp. 173–178, 1 map, 12 refs. Rostov-on-Don, 1926. [Recd. February 1927.]

The invasion of the Northern Caucasus by flying swarms of *Locusta migratoria*, L., in 1926 was of unprecedented extent and resulted in over 100,000 acres being infested with eggs. The infested areas were extremely scattered and the majority of them were in, or near, cultivated lands, which made it necessary to organise a campaign designed to exterminate the emerging larvae before they did any damage.

[KHLAMOV (V. V.).] Хламов (В. В.). **On the Amount of the Damage done to Crops by the Migratory Locust in the Northern Caucasus in 1926.** [In Russian.]—*Bull. N. Caucasian Plant Prot. Sta.*, no. 2, pp. 186–188. Rostov-on-Don, 1926. [Recd. February 1927.]

The invasion of the Northern Caucasus by swarms of winged locusts [*Locusta migratoria*, L.] in 1926 did not result in so much damage as had been expected, because it happened during harvest. Injury was recorded over an area of about 110,000 acres, and on about 80,000 acres the crops were completely destroyed. Millet suffered the most extensive damage, maize coming next. A large amount of injury was also done to reeds, which are used locally as fuel and for making roofs.

[ZAKHAROV (L. Z.).] Захаров (Л. З.). **Soil and Vegetation in the Areas infested with the Eggs of the Migratory Locust in the Northern Caucasus in 1926.** [In Russian.]—*Bull. N. Caucasian Plant Prot. Sta.*, no. 2, pp. 196–197. Rostov-on-Don, 1926. [Recd. February 1927.]

Most of the areas on which oviposition of the migratory locust [*Locusta migratoria*, L.] occurred were arable lands with dark or pale loamy soils, mainly on plains, or on gentle slopes, though there were some in the river valleys and on the bottoms of dry lakes. Maize and millet were most infested, then winter wheat; in the uncultivated areas infestation was most often observed in steppes covered with *Stipa* and *Artemisia*, but sometimes occurred on pure grassland or amongst reed-beds.

[KHLAMOV (V. V.).] Хламов (В. В.). **On the Biology of *Calliptamus italicus*, L.** [In Russian.]—*Bull. N. Caucasian Plant Prot. Sta.*, no. 2, p. 197. Rostov-on-Don, 1926. [Recd. February 1927.]

The oviposition of *Calliptamus italicus*, L., was unusually late in the steppes of the Northern Caucasus in 1926, occurring at the end of October and early in November. Normally it ceases about the end of September. The weather was warm and dry.

[DOVNAR-ZAPOL'SKIĬ (D. P.).] **Довнар-Запольский (Д. П.). On the Larvae of Acrididae.** [In Russian.]—*Bull. N. Caucasian Plant Prot. Sta.*, no. 2, pp. 153–172, 12 refs. Rostov-on-Don, 1926. [Recd. February 1927.]

This paper gives the results of a study of the morphology and colour characters of the larvae of the more common South Russian ACRIDIDAE, with a key for their identification and descriptions of the stages of development of the following species: *Acrida turrita*, L., *Chorthippus albomarginatus*, Zett., *C. dorsatus*, Zett., *Erichthippus pulvinatus*, F.W., *Parapleurus alliaceus*, Germ., *Oedaleus decorus*, Germ., *Locusta migratoria*, L., *Oedipoda coerulescens*, L., *Calliptamus italicus*, L., and *Podisma pedestris*, L.

[DEMOKIDOV (K. É.).] **Демонидов (К. Э.). The Hessian Fly in the Rural Economy of the Terek District.** [In Russian.]—*Bull. N. Caucasian Plant Prot. Sta.*, no. 2, pp. 56–62, 8 refs. Rostov-on-Don, 1926. (With a Summary in English, p. 188.) [Recd. February 1927.]

This is a short account of the methods of agriculture practised in the Terek region and their effect on infestation by *Mayetiola (Phytophaga) destructor*, Say. The common practice of ploughing all stubble in the wheat fields in March is the best method of preventing infestation and is considered more effective than late sowing.

[LAPPIN (G. I.).] **Ланпин (Г. И.). Pests of New Medicinal Plants in Northern Caucasus.** [In Russian.]—*Bull. N. Caucasian Plant Prot. Sta.*, no. 2, pp. 145–152, 8 refs. Rostov-on-Don, 1926. [Recd. February 1927.]

The cultivation of certain valuable medicinal plants is a comparatively new industry in the Northern Caucasus, and a number of common agricultural insect pests are beginning to attack these crops. An account is given of the pests noticed during 1926. *Loxostege sticticalis*, L., caused considerable injury to castor oil (*Ricinus communis*) by feeding on the leaves and stems; it also attacked fennel (*Foeniculum officinale*). *Euxoa segetum*, Schiff., occurs on both these plants and also on *Althaea* spp., *Rheum palmatum tanguticum*, *Carum carvi*, *Luffa gigantea* and *Nigella sativa*.

Other Lepidoptera observed on *Ricinus communis* were *Barathra brassicae*, L., *Phytometra (Plusia) gamma*, L., *Heliothis* sp., and *Pyrameis cardui*, L.

The Coleoptera, *Opatrum sabulosum*, L., *Gonocephalum pusillum*, F., *Pedinus femoralis*, L., and *Platyscelis gages*, Fisch., attack the young plants of castor, fennel and aniseed (*Pimpinella anisum*).

[ZAKHAROV (L. Z.).] **Захаров (Л. З.). The Common Wasp as a Pest of Grape-vines in the Terek Region in 1924.** [In Russian.]—*Bull. N. Caucasian Plant Prot. Sta.*, no. 2, pp. 183–185. Rostov-on-Don, 1926. [Recd. February 1927.]

During 1924 serious losses were experienced in the vineyards in the Terek region owing to the damage caused by *Vespa vulgaris*, L.; the pulp of the grapes was eaten out during August and September, and this was followed by rot, which spread to the healthy fruit.

[SUKHORUKOV (N. N.).] Сухоруков (Н. Н.). **Observations on *Phylloxera* in the Kuban Region in 1926.** [In Russian.]—*Bull. N. Caucasian Plant Prot. Sta.*, no. 2, pp. 189–193. Rostov-on-Don, 1926. [Recd. February 1927.]

Details are given of the local distribution of *Phylloxera* in the Kuban region, as a result of inspection work carried out during 1926. There has apparently been no further spread since the previous inspection in 1925, and this pest cannot be considered one of the causes of the great reduction in area under vines noticed since 1914.

[DOVNAR-ZAPOL'SKIĬ (D. P.).] Д[овнар]-З[апольский] (Д. П.). **On Outbreaks of some Forest Pests.** [In Russian.]—*Bull. N. Caucasian Plant Prot. Sta.*, no. 2, p. 198. Rostov-on-Don, 1926. [Recd. February 1927.]

Records are given of local outbreaks in forests in the Northern Caucasus of *Nygma phaeorrhoea*, Don. (*Euproctis chrysorrhoea*, L.), *Porthetria* (*Lymantria*) *dispar*, L., and *Diprion* (*Lophyrus*) *sertifera*, Geoffr. This sawfly caused considerable injury to pines, and is apparently recorded for the first time as a pest in the Northern Caucasus.

[NOVITZKIĬ (P.).] Новицкий (П.). **On the Abundance of *Pyrameis cardui*, L.** [In Russian.]—*Bull. N. Caucasian Plant Prot. Sta.*, no. 2, pp. 198–200. Rostov-on-Don, 1926. [Recd. February 1927.]

Though *Pyrameis cardui*, L., occurred in unusual abundance in various localities in the Northern Caucasus, the damage to cultivated plants was very slight.

[SHCHEGOLEV (V. N.).] Щеголев (В. Н.). **The Use of Poison Baits in the Control of Tenebrionids.** [In Russian.]—*Jl. Agric. Res. Don & N. Caucasus*, no. 8, pp. 89–100, 6 figs., 4 refs. Rostov-on-Don, 1926. [Recd. March 1927.]

This paper has already been noticed from another source [R.A.E., A, xiv, 212].

[SHCHEGOLEV (V. N.).] Щеголев (В. Н.). **Morphological Differences between the Larvae of *Cephus pygmaeus*, L., and *Trachelus tabidus*, F.** [In Russian.]—*Jl. Agric. Res. N. Caucasus*, no. 9, pp. 258–264, 9 figs., 4 refs. Rostov-on-Don, 1926. [Recd. March 1927.]

The larvae of the sawflies, *Cephus pygmaeus*, L., and *Trachelus tabidus*, F., are described. They were obtained from eggs laid by adults that had been isolated in cages placed in the field over both winter and spring sown wheat.

[VLADIMIRSKAYA (BOGDANOVA-KAT'KOVA) (L. I.).] Владимирская (Богданова-Кат'кова) (Л. И.). **On the Biology and Morphology of a new Pest of Grain Crops—*Podonta daghestanica*, Reitt.** [In Russian.]—*Jl. Agric. Res. N. Caucasus*, no. 9, pp. 328–333, 9 figs., 1 ref. Rostov-on-Don, 1926. [Recd. March 1927.]

Wireworms and similar larvae were very injurious in 1925 in the Northern Caucasus, causing the entire failure of the *Sorghum* crop

in some areas, by eating out the germinating part of the seeds. The species concerned included Elaterids and Tenebrionids, but the larvae of the Cistelid, *Podonta daghestanica*, Reitt., were the most numerous. They resemble Elaterid larvae and are probably frequently mistaken for them. Under experimental conditions they readily feed on seedlings of maize and wheat. The adults were noticed in June in wheat fields, mainly along the edges of the fields, from which they gradually migrated to various flowering plants, feeding on the pollen and possibly on the flowers. As many as 140 have been counted on one sunflower head. The eggs are most probably laid in the ground, and hatch during the same summer, the winter being passed in the larval stage. Pupation occurs in the ground. The larva and pupa are described in detail.

MORDVILKO (A.). **Sur la biologie du Phylloxéra de la vigne. Les conditions de sa vie souterraine. L'influence du climat.**—*C.R. Acad. Sci. France*, clxxxiv, no. 6, pp. 343–345, 1 ref. Paris, 1927.

*Phylloxera* cannot live on the roots of vines in sandy soil, owing to the absence of cracks or interstices, which allow the insects to move from one part of the root to another. If the pest is found to flourish on the roots of such vines, it is due to cracks being made in the soil, generally by the wind, which loosens the roots, particularly the more superficial ones. Vines with roots that do not grow deeper than 17 inches are therefore more susceptible to attack than those of deeper growth. Similarly, apple seedlings exposed to wind are more likely to harbour *Eriosoma lanigerum* on the roots than those in more sheltered positions. Vines that grow round tree-trunks and therefore cannot be shaken by the wind do not harbour *Phylloxera* on the roots.

In Transcaucasia whole vineyards are destroyed by *Phylloxera*, while in the Kuban Province much less damage is done, although the insect has been established there for many years, on account of the lower temperature, the very slow development of the insect, and the short vegetative period of the vine. In the same way *Illinoia* (*Acyrtosiphon*) *pisi* is very destructive in south Russia and almost harmless in the north.

SCHØYEN (T. H.). **Beretning om skadeinsektenes opptreden i land- og havebruket i årene 1922 og 1923.** [Report on Insect Pests occurring in Agriculture and Horticulture in 1922 and 1923.]—40 pp., 26 figs. Oslo, 1924. [Recd. March 1927.]

Pests recorded in Norway in 1922–23 and not mentioned in the later report noticed below include: *Limothrips cerealium*, *Aptinotrips rufus*, *Frankliniella* (*Physopus*) *tenuicornis*, *F. intonsa* (*P. vulgaritissimus*), *Lema* sp. and *Hylemyia coarctata*, on barley; *Macrosiphum granarium* on oats, wheat, barley and rye; *Contarinia* (*Cecidomyia*) *tritici* on wheat; and *Tarsonemus spirifex* on oats. *Apion apricans* attacked red clover.

*Gortyna* (*Hydroecia*) *micacea*, *Phthorimaea operculella* and *Ryphus fenestralis* occurred on potatoes; *Forficula auricularia*, *Eurydema oleraceum*, *Brevicoryne* (*Aphis*) *brassicae*, *Oryctes nasicornis* and *Plutella maculipennis* on crucifers; *Otiorrhynchus ligustici* on asparagus; and *O. dubius* (*nodosus*) on rhubarb. *Depressaria heracleana* was recorded for the first time as a pest of carrots.

Apple pests included *Plesiocoris rugicollis*, *Rhynchites coeruleus*, *Exapate congelatella*, and *Blastodacna putripennella*. *Thrips flavus*, *Aphis grossulariae*, *Zophodia convolutella* and *Pristiphora pallipes* (*Nematus appendiculatus*) attacked gooseberries, and *Abraxas grossulariata* both gooseberries and red currants. *Aleurodes fragariae*, *Cetonia aurata* and *Agrotis c-nigrum* occurred on strawberries, and *Incurvaria* (*Lampronia*) *rubiella* on raspberries.

*Diestrammena marmorata* was found in greenhouses.

SCHØYEN (T. H.). **Beretning om skadeinsektenes opptreden i land- og havebruket i årene 1924 og 1925.** [Report on Insect Pests occurring in Agriculture and Horticulture in 1924 and 1925.]—31 pp., 15 figs. Oslo, 1926. [Recd. March 1927.]

Pests of cereals in Norway in 1924–25 included *Tylenchus hordei*, *Heterodera schachtii*, *Limothrips denticornis*, *Aphis* (*Siphonaphis*) *padi*, *Miris dolabratus*, *Phytonomus arator* (*polygoni*), *Lygus pratensis*, *Oscinella frit*, *Chlorops taeniopus*, *Hydrellia griseola*, and *Tipula* sp. A serious outbreak of *Gastroidea* (*Gastrophysa*) *polygoni* occurred on grasses in August 1924, while *G. viridula*, which closely resembles it, caused considerable damage in 1925. An attack of *Charaeas graminis* broke out over the whole of northern Norway in 1922, and moved during the succeeding years toward the south and west, where the most serious outbreaks occurred in 1925.

Peas were attacked by *Contarinia pisi*, *Kakothrips* (*Physopus*) *robustus* and *Sitona lineata*, and clover by *Tylenchus dipsaci* (*devastatrix*), *Tortrix paleana* and *Perrisia* (*Dasyneura*) *leguminicola*. *Silpha opaca* and *Gastroidea viridula* attacked potatoes. Pests of crucifers included *Silpha opaca*, *Rhizotrogus solstitialis*, *Meligethes aeneus*, *Phyllotreta* sp., *Ceuthorrhynchus contractus*, *Gastroidea viridula*, *Barathra* (*Mamestra*) *brassicæ*, *Tipula oleracea* and *Phorbia* (*Chortophila*) *brassicæ*. A serious infestation of *Pieris brassicæ* occurred on cabbage and turnip throughout eastern and central Norway in 1925, but the pupae examined in August were found to be extensively parasitised by *Apanteles* (*Microgaster*) *glomeratus*. *Hylemyia antiqua* (*Anthomyia ceparum*) attacked onions, and *Pegomyia hyoscyami* (*A. conformis*), beet. Considerable damage was caused to celery and parsley by *Psila rosæ* in 1924 and to a smaller extent in 1925.

Pests reported on apple include *Psylla mali*, *P. pyricola*, *Aphis pomi*, *Typhlocyba rosæ*, *Lepidosaphes ulmi*, *Byturus tomentosus*, *Lacon murinus*, *Limoniæ aeruginosus*, *Cantharis obscura*, *Luperus flavipes*, *Phyllobius pyri*, *P. maculicornis*, *Anthonomus pomorum*, *Xyleborus dispar*, *Notolophus* (*Orgyia*) *antiquus*, *Calymnia trapezina*, *Biston pomonaria*, *Phigalia pædaria*, *Hybernia defoliaria*, *Cheimatobia brumata*, *Argyroplœce* (*Olethreutes*) *variegana*, *Cydia pomonella*, *Hypomœuta malinellus*, *Hemerophila* (*Simaethis*) *pariana*, *Lyonetia clerkella*, *Parornix* (*Ornix*) *guttea*, *Argyresthia conjugella*, and the mites, *Paratetranychus* (*Tetranychus*) *pilosus* and *Eriophyes malinus*.

Pears were attacked by *Taeniothrips inconsequens*, *Acanthosoma haemorrhoidale*, *Psylla pyrisuga*, *Phyllobius maculicornis*, *P. pyri*, *Cheimatobia brumata*, *Caliroa* (*Eriocampoides*) *limacina*, *Contarinia* (*Diplosis*) *pyrivora*, *Perrisia* (*Dasyneura*) *pyri* and *Eriophyes pyri*. Plums were injured by *Hoplocampa fulvicornis*, *Lepidosaphes ulmi*, *Lecanium corni*, *Typhlocyba rosæ* and *Cheimatobia brumata*. *Olethreutes pruniana* has caused damage to apricots for several years in

succession. *Phyllobius pyri* and *P. maculicornis* attacked plum and cherry, while *Argyresthia ophippiella* was reported on plum, cherry and apricot. Other pests of cherry are *Cantharis obscura*, *Byctiscus betulae* (*Rhynchites betuleti*), *Cheimatobia brumata*, *Lyonetia clerkella* and *Caliroa limacina*. Pests of currants include *Capitophorus* (*Myzus*) *ribis*, *Eriosoma* (*Schizoneura*) *ulmi*, which damaged the young bushes, *Lecanium ribis*, *Chionaspis salicis*, *Incurvaria capitella* and *Otiorrhynchus ligustici*. *Pteronus* (*Nematus*) *ribesii* has caused considerable damage in several districts to both currants and gooseberries, and *Eriophyes ribis* is becoming increasingly serious on black currant. Strawberries were attacked by *Oxygrapha* (*Teras*) *comariana*, *Tipula* sp. and *Tarsonemus fragariae*, and raspberries by *Byturus tomentosus*, *Anthonymia* sp., *Lasioptera rubi* and *Tetranychus* sp.

Notes are also given on the pests of ornamental plants, the insects infesting foodstuffs, and those found in houses.

MARSHALL (G. A. K.). **New Injurious Curculionidae (Col.).**—*Bull. Ent. Res.*, xvii, pt. 3, pp. 199–218, 1 pl., 2 figs. London, March 1927.

The following new weevils are described: *Blosyrus batatae* on sweet potato, *Mimauleodes hirtulus* on melons, *Protostrophus gonoderes* on grape-vines, *P. consobrinus* on almond, *P. oblongus* on orange, *P. gulo* on cotton, *P. ocularius* on ground-nuts (*Arachis hypogaea*), *P. gonocnemis* on beans, *P. crinitus* on ground-nuts and cotton, *P. vastator* on cotton, tobacco, sweet potatoes, ground-nuts and maize, and *P. latirostris*, on roses and young fruit trees, all from South Africa; *P. compactus* and *P. cognatus* on cotton in Portuguese East Africa; *Iphisomus ignatus*, on seedling cotton in the Transvaal and Portuguese East Africa; *Hodurus* (gen.n.) *dispar* on maize, and *Ellimenistes echinatus* on lemon, in South Africa; *E. horridus* on cotton in Portuguese East Africa; *Dicasticus mlanjensis* on tea in Nyasaland and also recorded from Portuguese East Africa; *Holorygma* (gen. n.) *pilosa* on lemon in the Transvaal; *Goniorrhinus hardenbergi* on cotton in Portuguese East Africa; *Chalcodermus bondari* on cotton in Brazil; *Lophobaris* (gen. n.) *serratifipes*, bred from pepper seeds in Java and also occurring in the Malay Peninsula; and *Omobaris* (gen. n.) *calanthes* on an orchid, *Calanthe veratrifolium*, in Java.

The author has received a long series of adults and larvae of the species described by C. A. Marelli as *Dacnirotatus bruchi* and *D. platensis* [*R.A.E.*, A, xiv, 434], and these show that *D. bruchi* is synonymous with the Australian *Gonipterus gibberus*, Boisd., while *D. platensis* is based on immature specimens of the same species.

BODKIN (G. E.). **The Fig Wax Scale (*Ceroplastes rusci*, L.) in Palestine.**—*Bull. Ent. Res.*, xvii, pt. 3, pp. 259–263, 1 pl., 1 fig., 4 refs. London, March 1927.

*Ceroplastes rusci*, L. (fig wax scale) is the most important pest of fig in Palestine, where it flourishes only in the hill districts, especially on trees grown in a sheltered position near an abundant supply of water. Fig trees do not appear to be seriously affected by the actual presence of this insect, but its sticky secretion is carried all over the tree by the heavy dews during the summer, and the sooty mould which grows on it seriously hinders the natural functions of the leaves, reduces the market value of the fruit, and renders it unsuitable for drying.

At an elevation of some 2,500 ft. adult scales produce young larvae at the end of April or the beginning of May, when the foliage of the fig tree is well advanced. The adults die as soon as reproduction is completed. The young larvae are exceedingly active and wander over the twigs and leaves in search of a suitable feeding place. In about a week's time they settle down on the upper surface of leaves shaded from the direct rays of the sun, usually along the ribs. After a month they migrate to the stems of the leaves or to the upper, more tender parts of the young shoots. During these earlier stages great mortality takes place, owing to predacious insects or unsuitable environment, and it is calculated that only about 3 per cent. of the larvae originally produced reach maturity. The sticky secretions appear about this period and two species of ants and numerous small flies, including *Ceratitis capitata*, Wied. (Mediterranean fruit-fly), are attracted by them. The first summer generation is sexually mature in 70-80 days and begins to produce larvae. The second generation takes longer to mature, owing to the general drop in temperature, and is not full-grown until late autumn. The winter is passed in the adult stage. Thus in Palestine at altitudes of 990-2,600 ft. there are two generations a year. Many adults perish in the autumn because they are attached to stalks and leaves that are shed, and a cold winter also causes some mortality, although the Coccids can withstand temperatures a few degrees below zero.

In Palestine the adults are extensively parasitised by the Chalcid, *Scutellista cyanea*, Motsch., which completely destroyed the Coccids on an experimentally infested fig tree, although the scale had never been observed on figs in the vicinity. The Coccinellid, *Chilocorus bipustulatus*, L., feeds on the larvae.

Although the adult scales resist sprays to some extent, it has been found more satisfactory to treat infested trees during the winter when they are bare, owing to the large quantity of material necessary to cover the thick foliage of the tree in the spring (when the unprotected larvae emerge) and the difficulties experienced in correctly observing the appearance of the larvae. Experiments indicate that winter spraying with a lime-sulphur compound or an oil emulsion of high concentration will give the most effective control. Owing to the scattered nature of fig cultivations the cost of fumigation with hydrocyanic acid gas would be prohibitive, although this method would undoubtedly be satisfactory.

Descriptions of the female at various ages and of the larva of *C. rusci*, by F. Laing, are appended.

WITHYCOMBE (C. L.). **The South American Boll-worm of Cotton** (*Sacadodes pyralis*, Dyar).—*Bull. Ent. Res.*, xvii, pt. 3, pp. 265-272, 2 pls., 7 refs. London, March 1927.

A brief account of the biology of *Sacadodes pyralis*, Dyar, has already been noticed [*R.A.E.*, A, xiv, 47]. It occurs in Trinidad (where these observations were made), Venezuela, Argentina, British Guiana and Colombia. The moths emerge about sunset, and are nocturnal in habit. They are attracted to artificial lights, and since moths captured in this manner have been mainly gravid females, light traps might be used as a control measure. The total number of eggs laid by a single female is at least 100; they hatch in 5-6 days. The method by which the larvae enter the bolls is discussed at length. The first moult

usually occurs about 3 days after hatching, and if the larva has reached the lint, may take place inside the boll, but approximately 70 per cent. of the larvae return to the outside. The larva is forced to emerge to moult, since it cannot remain inside the wall of the boll without keeping down the rapidly proliferating tissue by feeding upon it. Having moulted, it re-enters the boll immediately and remains inside until it is full grown (about 15 days after hatching), when it eats its way out and descends to the ground, where it pupates. If bolls are not available, the larvae feed on the inner parts of the flower buds or flowers. While awaiting ecdysis the larvae were observed to be preyed upon by Coccinellid beetles and Chrysopid larvae, and in one instance by a thrips.

Of the control measures suggested the cultural measures are most important, though the collection of eggs by children and the use of arsenicals and other stomach poisons against the newly hatched larvae might be of some value. The crop should come to maturity during a short intense period, and this may be accomplished by attention to variety, spacing and time of sowing. A close season of at least two months should be observed, and if the soil is turned at this time, the pupae will be exposed to destruction by the sun, birds, etc. Indian cottons appear to be less attacked than American varieties, possibly owing to their greater hairiness. In Trinidad the boll period, from setting until opening, also appears to be less for the Indian varieties than for American Upland or Sea Island cottons, which would give the insect a shorter period for attack. Varieties showing rapid and marked proliferation of the boll walls after puncture would probably reduce the chances of survival of the young larvae. How the insect exists from June until October has not yet been determined. The fact that no resting pupa, such as occurs in Africa with the allied *Diparopsis castanea*, Hmps., has been noticed, suggests that the decrease in numbers is consequent upon food shortage.

THOMPSON (W. R.). U.S. Bur. Ent. **A Method for the Approximate Calculation of the Progress of Introduced Parasites of Insect Pests.**—*Bull. Ent. Res.*, xvii, pt. 3, pp. 273-277, 7 refs. London, March 1927.

This paper shows how the mathematical method previously discussed [*R.A.E.*, A, x, 386, 519; xiv, 568] may be of practical value in determining approximately the length of time, at any given moment, that must still elapse before the final subjugation of an insect pest by an introduced parasite. The original formulae, which are based on such factors as the initial numbers of parasites and hosts and the ratio between their effective rates of production, are modified in order to afford a rough estimate when the only data available are the initial number of parasites liberated and the percentage of infested hosts at the time the calculations are undertaken.

CHINA (W. E.). **A new Genus and Species of Capsidae (Heteroptera) from the Flowers of *Cola acuminata* in Sierra Leone.**—*Bull. Ent. Res.*, xvii, pt. 3, pp. 285-287, 2 figs. London, March 1927.

*Torma colae*, gen. et sp. n., is described from Sierra Leone on kola flowers (*Cola acuminata*).

BALLARD (E.). **Some Insects associated with Cotton in Papua and the Mandated Territory of New Guinea.**—*Bull. Ent. Res.*, xvii, pt. 3, pp. 295–300, 1 map. London, March 1927.

A list of over forty insects found on cotton and related plants in Papua, New Guinea and the neighbouring islands is given, with notes on their distribution. *Platyedra gossypiella*, Saund., was found in Papua on the coastal plantations and in the vicinity of the ginneries at Port Moresby. It was also found on a single bush of Kidney cotton, which must have been of considerable age, six miles from the nearest plantation. At Tavai, where *Hibiscus* spp. were thoroughly infested, there was a proportion of the Queensland form, *P. scutigera*, Holdaway [*R.A.E.*, A, xiv, 459]. This species had probably been imported from Queensland with the seed for the plantation, before the institution of treatment of cottonseed by heat. It is possible, though improbable, that *P. gossypiella* is indigenous to Papua. It does not occur in Queensland and cannot therefore have been imported with seed from there; the only other possible source would appear to be Fiji. Of the other bollworms, *Earias fabia*, Stoll, was the most common. In Papua the potash-deficient soils suffered most from attacks of *Empoasca* sp. At Rabaul (New Britain) the soil showed no deficiency, or only a slight one of phosphoric acid, yet the damage by Jassids was even more marked in this locality. There was some other factor present that inhibited root development, as the tap-roots only penetrated a short distance into the soil and then grew horizontally, though there was unlimited depth of soil. At Tavai, in Papua, there was no sign of Jassid damage. Notes are given on the distribution of the spotted and banded forms of *Dysdercus cingulatus*, F., which were abundant almost everywhere, though some varieties of cotton did not seem to be attacked. *D. papuensis*, Dist., was found on Caravonica cotton on Goodenough Island. *Tectocoris lineola*, F., was fairly common in Papua and New Britain. What appears to be an undescribed species of *Oxycarenus* was abundant in Papua but rare in New Guinea. The damage done in some plantations in Papua by leaf-eating caterpillars was probably due to *Prodenia litura*, F., or to *Heliothis obsoleta*, F. The latter was found on cape gooseberry [*Physalis*] and *Abutilon indicum* in Papua and on maize in New Britain. *Dichocrocis* (*Conogethes*) *punctiferalis*, Guen., a severe pest of late-planted cotton in Queensland, was found on a castor plant [*Ricinus communis*] in New Guinea, but not on cotton. The general climatic conditions, even in the dry belt of Papua, would favour the increase of internal boll-rots, and cotton both there and in New Guinea would probably suffer from these diseases more than any other.

SPEYER (E. R.). **An Important Parasite of the Greenhouse White-fly** (*Trialeurodes vaporariorum*, Westwood).—*Bull. Ent. Res.*, xvii, pt. 3, pp. 301–308, 3 pls., 8 refs. London, March 1927.

*Encarsia formosa*, Gahan, was found parasitising *Trialeurodes vaporariorum*, Westw., on *Cassia tomentosa* in a greenhouse in Britain in 1926, and later it eradicated its host on cucumber plants and spread to tomato plants in an adjoining part of the greenhouse. The stages of this Chalcid are described. The females have been observed feeding on the honey-dew secreted by the whitefly.

Reproduction is parthenogenetic, males, probably impotent, only appearing when temperatures are low. A single egg is deposited in the

whitefly pupa at a period shortly after the third ecdysis (in warm weather some three weeks after the whitefly egg hatches), and it is probable that each female is capable of parasitising 50 pupae. This appears to be the only stage selected by the parasite for oviposition, and females have been observed late in the season to rest for days on leaves where only very young scales were present, as if waiting for the latter to reach the right stage of development to receive an egg. The duration of the egg stage has not been determined exactly, but would appear to be not more than four days. A parasitised scale usually becomes black and may thus be distinguished from normal ones. The larvae consume the whole of the whitefly pupae, and are full-fed some 14 days after hatching. The duration of the pupal stage is about 10 days, and the adult emerges from the pupal skin and escapes from the scale-covering through a circular hole that it cuts in it.

The normal life-cycle of *E. formosa*, from the laying of the egg to the emergence of the adult, thus corresponds with that of its host, which occupies from 28–30 days. The length of life of the female parasite must be considerable, as individuals have been kept ovipositing over a period of 9 days and then had not deposited all their eggs. They are also able to cover considerable distances in search of whitefly scales at a suitable stage for oviposition. The emergence of adults of any one generation is continued over a period of at least three weeks, and it seems probable that the adults may remain inside the scale for some time before emerging. These habits are evidently an adaptation to ensure the parasite finding at least a fair proportion of scales at the right stage of development to receive an egg. *E. formosa* thrives best at high temperatures. When the temperatures fell during the autumn the numbers decreased, but increased again when the greenhouse was heated. At present it is not certain how *E. formosa* passes the winter; it may hibernate inside the host as a pupa or adult, but the fact that it continues to breed when artificial heat is applied suggests that it may be a tropical insect without a hibernating period.

Fumigation with hydrocyanic acid gas for the control of the whitefly does not affect the parasites. The scale stages of the whitefly do not live long on foliage that has been removed from the plant, but during September parasites were reared from such material up to 23 days after its removal, showing that foliage bearing parasitised scales can be removed as soon as they turn black without injury to the parasite. Although as many as 20 per cent. of the parasites may be injured, the best way to distribute them is by detaching the blackened pupae of the whitefly from the foliage and suspending them in small open glass tubes tied to the stems of infested plants, for although 100 per cent. emergence was obtained when whole branches were detached and pinned to fresh plants, this method involves the risk of disseminating various other pests and diseases.

WILKINSON (D. S.). **On Two New Parasites from West Africa bred from the Cacao Barksapper (*Sahlbergella*).**—*Bull. Ent. Res.*, xvii, pt. 3, pp. 309–311, 2 figs. London, March 1927.

The Braconid, *Euphorus sahlbergellae*, sp. n., was reared from the Capsid, *Sahlbergella singularis*, Hagl., which is a serious pest of cacao trees in the Gold Coast. An Ichneumonid, *Mesochorus melanothorax*, sp. n., was reared from *S. singularis* at the same time as *E. sahlbergellae*, and there can therefore be no doubt but that it is parasitic on the latter.

WILKINSON (D. S.). **Some Notes on *Syringopais temperatella*, Led., in Cyprus.**—*Bull. Ent. Res.*, xvii, pt. 3, pp. 313-314. London, March 1927.

A brief account of the bionomics of *Syringopais temperatella*, Led., has already been noticed [*R.A.E.*, A, x, 16]. The adults are on the wing in Cyprus in the late spring or early summer, some little time before the wheat is cut. The eggs are probably laid in the soil, where they persist through the hot weather, hatching some time during the winter. The larvae immediately attack the young wheat, sometimes destroying the plants over extensive areas.

This moth is again becoming a major pest in Cyprus, probably owing to the fact that no serious effort has been made by the farmers to put in effect the measures suggested by the Agricultural Department for its control [*R.A.E.*, A, vii, 88]. The local conditions that make it difficult to carry out these measures are discussed.

The distribution of the moth is irregular, and an investigation of the reason for this might lead to a discovery of the natural factors controlling it. In ten minutes many moths were caught on the oily glass of an ordinary hurricane lantern placed in a field about two feet above the standing wheat during the early part of one night, but whether light traps would prove an economical remedial measure has not been ascertained. Wheat fields that have been severely attacked produce no crop, unless, after the pupation of the pest, there is sufficient rain to enable the plants to recuperate.

DAVEY (H. W.). **The Currant Moth (*Trochilium tipuliformis*, Clerck).**—*Jl. Dept. Agric. Victoria*, xxv, pt. 1, pp. 39-40. Melbourne, January 1927.

*Aegeria (Trochilium) tipuliformis*, Clerck, is recorded for the first time from the mainland of Australia. It is already established as a pest of bush fruits in New Zealand and Tasmania [*R.A.E.*, A, vii, 48]. A short account is given of its bionomics and control.

MUNGOMERY (R. W.). **Report of the Southern Assistant Entomologist.**—*Queensland Agric. Jl.*, xxvii, pt. 2, pp. 83-84. Brisbane, 1st February 1927.

Further studies of the Dynastid beetle, *Pentodon australis*, Blackb. [*R.A.E.*, A, xv, 176] have shown that in cages containing sugar-cane sets the eggs were laid singly throughout the soil, each one being enclosed in a small pellet of earth, and hatched in about a fortnight. The larvae fed and developed rapidly and had reached the third instar at the time of writing. Sugar-cane was found in late August and early September to be damaged by the larvae of an unidentified Melolonthid, this being followed by injury due to *Lepidiota frenchi*, Blackb.

JARVIS (E.). **Cane Pest Combat and Control.**—*Queensland Agric. Jl.*, xxvii, pt. 2, pp. 85-88, 1 fig. Brisbane, 1st February 1927.

The army worms, *Cirphis loreyi*, Dup., and *C. unipuncta*, Haw., caused a severe infestation in one locality, but were held in check by spraying a strip of sugar-cane in front of the advancing caterpillars

with 2 lb. lead arsenate in 50 gals. water and using a poison bait of 1 lb. Paris green, 2 qts. molasses and 20 lb. bran, with enough water to make the mass moist enough to crumble between the fingers. Another termite in addition to *Mastotermes darwiniensis*, Frogg., has been found destroying canes and has been identified as *Coptotermes acinaciformis*, Frogg. It attacks the sets after planting and also occasionally tunnels in growing cane to a height of 3 ft. or more above the ground. The application of a pint of benzine or 2-3 oz. calcium cyanide flakes in a hole made at the top of the termitarium and afterwards sealed with wet soil is an effective remedy.

TILLYARD (R. J.). **The Giant Horntail. A Serious Menace to Pine Plantations.**—*Nelson Evening Mail*, 9th February 1927, p. 6. Nelson, 1927.

Unusually large individuals of *Sirex juvencus*, L., have been found in sections of healthy *Pinus radiata* from Seddon, New Zealand. The exceptional size of the individuals of both sexes is attributed to the abundance of food present, owing to the existence of pure stands of *P. radiata*. The climatic conditions are also very favourable to *S. juvencus*, which is likely to become a very serious pest in New Zealand. A study of the parasites of this pest (*Rhyssa* sp. and *Ibalia* sp.) in other countries should be begun immediately with a view to their introduction into New Zealand.

ASHBY (S. F.) & NOWELL (W.). **The Fungi of Stigmatomycosis.**—*Ann. Bot.*, xl, no. 157, pp. 69-83, 2 pls., 14 refs. London, January 1926.

Descriptions are given of four fungi, of common occurrence in the British West Indies, that are connected with stigmatomycosis of fruits. In this disease externally sound fruit is internally infected as a result of punctures by plant-feeding bugs of the sub-order Heteroptera. These fungi correspond to those referred to in previous literature as Nowell's types A, B, C and D [*cf. R.A.E.*, A, xv, 200, etc.]. Type A is *Spermophthora gossypii*, gen. et sp. n., which was predominant in St. Vincent (1916-17) in Sea Island cotton infested with *Dysdercus*. It has also been recorded from cotton bolls in Jamaica, Nevis, Montserrat, the Grenadines and Trinidad, from tomato fruits in St. Vincent and Trinidad, and from the seeds of cowpea in St. Vincent. Type B is *Eremothecium cymbalariae*, Borzi, recorded from cotton bolls in St. Vincent and Montserrat, and comprising 89-95 per cent. of the infection of bolls from Tortola (Virgin Islands) and Nevis in 1918. It was fairly common in tomato fruits in St. Vincent in 1917. Type C is *Nematospora gossypii*, sp. n., recorded from cotton bolls in Antigua, Nevis, St. Vincent, the Grenadines and Trinidad, and comprising 90-100 per cent. of the infections in bolls collected in Montserrat in 1917 and 1918. It has also been found in seeds of *Datura metel* in Montserrat, in seeds of *Asclepias curassavica* in Trinidad, and in cotton bolls from Nyasaland. Type D is *Nematospora coryli*, Peglion, which is the most generally distributed agent of stigmatomycosis in the West Indies, being found in fruits of at least 16 genera and 8 orders. It has also been recorded from China, Japan, the Philippines, South California, Virginia, Mexico, and Cuba. On cotton it is usually associated with *Nezara viridula*, L., or with other bugs that have a wider

range of food-plants than *Dysdercus*. *Nezara* is very abundant at times on various genera of cultivated leguminous plants and transfers infection from these plants to neighbouring cotton.

GOWDEY (C. C.). **Insecticides and Fungicides.**—*Dept. Agric. Jamaica, Ent. Circ. 12*, 12 pp. Kingston, 1927.

Formulae for 46 insecticides and fungicides are given, with notes on their preparation and use.

REICHENSBERGER (A.). **Neue eigenartige Parasiten von Termiten.** [New peculiar Parasites of Termites.]—*Bull. Soc. fribourg. Sci. nat., C.R. 1920-1921 & 1921-1922*, xxvi, pp. 103-114, 1 ref. Fribourg, 1923. [Recd. February 1927.]

Fungi of the genus *Termitaria*, which are parasitic on termites, have been recorded in the United States, Grenada, Sardinia, the Belgian Congo and Cape Colony. *T. thaxteri*, sp. n., is here described from termites in Brazil.

PORTER (C. E.). **Diaspino nuevo para la fauna de Chile.** [A Diaspine new to the Fauna of Chile.]—*Rev. chil. Hist. nat.*, xxx, p. 63. Santiago, 1926. [Recd. March 1927.]

*Leucaspis pini*, Hart., a Coccid not previously recorded in Chile, was taken on *Pinus pinaster*.

KELSALL (A.). **Recent Experiments on Budmoth Control.**—*Canad. Hort.*, Fruit & Truck edn., 1, no. 2, p. 28. Peterboro, Ont., February 1927.

Until recently bud-moths in the orchards of Nova Scotia have been kept in check by arsenical dusts and sprays in conjunction with conditions of natural control. During the last few years, however, natural control appears to have been almost non-existent, and the arsenical dusts and sprays have proved inadequate. Experiments were therefore carried out with various combinations of insecticides and fungicides in an apple orchard heavily infested with bud-moths, particularly the eye-spotted bud-moth [*Eucosma ocellana*, Schiff.]. The first application was made when the tips of most of the buds were breaking, and the results showed that nicotine was the only insecticide that would be effective before the buds were actually attacked, that it could be used in combination with any of the fungicides, and that the use of a spreader did not increase the efficacy of the spray. The nicotine was used at the rate of 1 qt. to 100 gals., but from the results of further work it appears that half this strength would be equally effective. Some of the larvae were killed inside their silken coverings before they had done any feeding, probably owing to the spray entering the exit holes that they had already prepared. Two more pre-blossom sprays about eight days apart and one calyx spray were applied with the same materials. Nicotine gave remarkably good control (100 per cent. in some cases), and the use of the spreader did not increase its effectiveness. Calcium arsenate sprays (5 lb. to 100 gals.) showed a fair control and were apparently more effective in combination with lime-sulphur fungicides than with Bordeaux mixtures, while the use of a spreader appeared to increase their efficiency to some extent.

CAESAR (L.). **The Spray Service in Ontario.**—*Canad. Hortic.*, Fruit & Truck edn., 1, no. 2, p. 29, 1 fig. Peterboro, Ont., February 1927.

A brief account is given of the work of the spray service of the Ontario Department of Agriculture. Trained supervisors are appointed for each apple-growing area, and growers wishing to avail themselves of their services must undertake to have a satisfactory spray outfit and spray materials ready before the spraying season begins, to use only those mixtures recommended, and to spray when instructed by the supervisor and in a manner satisfactory to him.

SMITH (L. B.). **Japanese Beetle Control.**—*New Jersey Dept. Agric.*, Circ. 90, 31 pp., 12 pls. Trenton, N.J., December 1925. [Recd. March 1927.]

This circular deals with the control of *Popillia japonica*, Newm. (Japanese beetle) [*R.A.E.*, A, xiv, 154, 428; xv, 144], with particular reference to methods of enforcing quarantine.

VAN LEEUWEN (E. R.). **Sodium Oleate—Oleoresin of Pyrethrum Spray.**—*New Jersey Dept. Agric.*, Circ. 92, 3 pp. Trenton, N.J., March 1926. [Recd. March 1927.]

Instructions are given for the preparation of a contact spray against the Japanese beetle [*Popillia japonica*, Newm.], the formula for which has already been noticed [*R.A.E.*, A, xiv, 656].

VAN LEEUWEN (E. R.) & VAN DER MEULEN (P. A.). **Coated Arsenate of Lead.**—*New Jersey Dept. Agric.*, Circ. 96, 4 pp. Trenton, N.J., March 1926. [Recd. March 1927.]

Instructions are given for the preparation of the coated lead arsenate spray for use against the Japanese beetle [*Popillia japonica*, Newm.] that has already been described [*R.A.E.*, A, xiii, 631].

MCINDOO (N. E.). U.S. Bur. Ent. **Senses of the Cotton Boll Weevil—an Attempt to explain how Plants attract Insects by Smell.**—*Jl. Agric. Res.*, xxxiii, no. 12, pp. 1095–1141, 16 figs., 60 refs. Washington, D.C., 15th December 1926. [Recd. March 1927.]

This paper describes a thorough investigation into the senses and sense-organs of *Anthonomus grandis*, Boh. (cotton boll weevil) made with the object of determining the means by which the cotton plant attracts that insect. Years ago the author studied the olfactory pores first described by Hicks in 1857 in Hymenoptera and Coleoptera and decided that they serve as olfactory organs, and, having described the structure of the sense organs of both larvae and adults, he records experiments showing how plants attract insects by smell [*R.A.E.*, A, xiv, 456]. He is very doubtful, however, whether it is possible to reproduce accurately the odour or odours that emanate from a plant merely by using the constituents derived from the plant by chemical means, and insects, having a keener sense of smell than human beings, should be able to distinguish the differences more readily. The antennae of boll weevils have four types of sense organs, including many innervated hairs, chiefly on the club, three or four olfactory pores at the base of each antenna and two so-called auditory organs in

the second segment. Olfactory pores also occur on other parts of the body, in both the adult and larva. The author believes the senses of smell and taste in insects to be inseparable. The olfactory sense seems to be the only one that can serve to attract the weevils to cotton plants from a distance, and many experiments were conducted in the hope of finding a substance that would attract boll weevils as powerfully as cotton squares (flower buds) do. Saccharine, sugar, ice-cream powder, a sweetened form of calcium arsenate, honey and three brands of molasses were tried, but none of them gave any indication of being of any practical use in the control of the weevils.

[**A Summary of Insect Conditions in U.S.A. and Canada in 1926.**]—*Insect Pest Survey Bull.*, vi, no. 10, pp. 333–341. [Washington, D.C., 1927.]

Numbers of insects that have not been dealt with in special investigations are recorded in this survey, with particular reference to their local distribution in the United States. The most striking entomological feature of 1926 was the widespread and destructive abundance of several species of cutworms, including *Chorizagrotis auxiliaris*, Grt. (army cutworm), which did much damage to wheat and lucerne, *Lycophotia margaritosa* var. *saucia*, Hb., *Euxoa ochrogaster*, Gn. (red-backed cutworm), *E. tristicula*, Morr., *E. excellens*, Grt., and *Porosagrotis orthogonia*, Morr. *Euethela rugiceps*, Lec., was sufficiently injurious to necessitate re-planting of maize in some localities and also damaged sweet potatoes in Mississippi. *Cephus pygmaeus*, L. (wheat-stem sawfly) infested up to 50 per cent. of the wheat in large tracts of Manitoba and Alberta. *Leptocoris trivittatus*, Say (box-elder bug) caused considerable damage in Washington by puncturing the fruit of apples and has been reported for the first time from North Carolina. *Conotrachelus anaglypticus*, Say (cambium curculio) caused one of the most serious outbreaks known in the pecan-growing districts of southern Mississippi. There was a serious outbreak of *Typophorus viridicyaneus*, Crotch, on sweet potatoes in Georgia, and in Alabama stored sweet potatoes were damaged by *Araccerus fasciculatus*, DeG. *Crioceris duodecimpunctata*, L. (spotted asparagus beetle) was observed for the first time in Illinois. There was a sudden outbreak of *Psallus seriatus*, Reut. (cotton flea-hopper) in the southern States. Shade-tree pests included the bagworm, *Thyridopteryx ephemeraeformis*, Haw., *Fenusa pumila*, Klug (birch leaf-miner) and *Ellopia fiscellaria*, Gn. (hemlock spanworm). Other pests included the moth, *Mineola scitulella*, Dyar, on prunes, the Coccid, *Lecanium coryli*, L., *Otiorrhynchus* (*Brachyrhinus*) *sulcatus*, F. (black vine weevil) and *Phthorimaea glochinella*, Zell. (egg-plant leaf-miner), the last two being recorded for the first time in Southern California. The weevil, *Glyptoscelis squamulata*, Crotch, damaged grapes in California.

DAVIS (J. J.). **The European Corn Borer.**—*Purdue Univ. Agric. Expt. Sta.*, Circ. 138, 18 pp., 10 figs. Lafayette, Ind., December 1926. [Recd. March 1927.]

In consequence of the establishment of the European corn borer [*Pyrausta nubilalis*, Hb.] in the north-east of Indiana in 1926, farmers

are urged to make every effort to control the infestation before the insect has increased to very destructive numbers. An account is given of the general situation with regard to this pest in the United States and the measures taken to check its increase, the quarantine measures enforced against it and the introduction of its parasites from Europe.

BABCOCK (K. W.). **The European Corn Borer, *Pyrausta nubilalis*, Hübner: I. A Discussion of its Dormant Period.**—*Ecology*, viii, no. 1, pp. 45–59, 10 refs. Lancaster, Pa., January 1927.

The following are the author's conclusions to this paper on the occurrence of a dormant period in the development of the larva of *Pyrausta nubilalis*, Hb.

After a certain period of development, the intervention of a dormant or "rest" period is essential for the general welfare of the species. This dormant period, although inherent in the species, is modified by environmental conditions. Together with this modification, arise peculiarities in habit concomitant with different seasonal cycles, making it impossible to use the same standard of correlation during the growing season for the study of the relation of the environment to development in both the one-generation and the two-generation types. The inception of dormancy in the corn borer is not initiated by a fall of temperature; neither does heat alone at certain times during this period cause it to emerge from this state and resume development. The chief requirements of this "preparation" period are a continued exposure to a certain degree of cold, accompanied by abundant contact moisture. The larva is very sensitive to changes in contact moisture during the dormant period. If desiccation occurs at this time, retardation of pupation results, and if the loss of moisture is not compensated for before active development begins, the number of one-generation individuals present in the descendants tends to increase. The effects produced in the dormant period tend to become cumulative in the race, if the causes producing them are repeated. The determination of the physiological constitution of the insect at the time of entrance into the dormant period and the changes that take place during the "preparation" period are essential, before accurate correlation of the changes in the seasonal cycle with fluctuations of the environment can be undertaken. The immediate line of research to be instituted in connection with this problem should follow the determination of the possibility of applying to it Roubaud's hypothesis [*R.A.E.*, B, xi, 55].

WHELAN (D. B.). **The Winter Fauna of the Bunch-grasses in Eastern Kansas.**—*Ecology*, viii, no. 1, pp. 94–97, 10 refs. Lancaster, Pa., January 1927.

It has been suggested that burning bunch-grass (*Andropogon*), which affords an ideal hibernating place for many insects, especially *Blissus leucopterus*, Say (chinch bug), would help in destroying this pest. Since there is the possibility of destroying more beneficial insects than injurious ones by this method, observations were carried out on

their relative proportions, and it was found that, if the inhabitants of the grasses were all killed when their hibernating places were burned, many more injurious insects than beneficial ones would be destroyed.

PEIRSON (H. B.). **Control of the Bronze Birch Borer by Forest Management.**—*Jl. Forestry*, xxv, no. 1, pp. 68-72, 3 refs. Washington, D.C., January 1927.

*Agrilus anxius*, Gory (bronze birch borer) is the most destructive pest of the paper or white birch (*Betula papyrifera*), which is an important element in the lumbering and wood-turning industries in the North-eastern United States. This Buprestid is widely distributed and has been reported feeding on other species of *Betula*. A brief account of its life-history is given [*R.A.E.*, A, xi, 554].

Observations showed that birches left standing after logging operations soon died and had almost invariably been injured by *A. anxius*; that birches on the edges of clearings were usually attacked; and that ornamental birches planted in the open were the most noticeably damaged; while birches growing in relatively dense stands were practically immune. Experiments were therefore carried out to determine if the density of the stands whether pure or mixed was related to the amount of damage done by the borer. The results proved conclusively that stands should be maintained at a density of at least 240 dominant and co-dominant trees of all species to the acre to prevent attack. An average infestation of 9 per cent. of the trees results from each decrease of 20 trees from this density. The general average density of white birch stands is sufficient to prevent much injury, and it is not until they are opened up that the real danger occurs. This can be largely averted by cutting all the trees at the same time, or in the case of mixed stands where this is not possible, by cutting the white birch within two or three years of the removal of the protecting trees. So far no means of saving infested ornamental trees has been discovered, but the following experiment has given promising results. Slanting holes bored into the trunk of a tree two inches deep and four inches apart were filled with a solution of aloes and plugged with paraffin wax. The solution, which is very bitter but non-poisonous, was carried through the tree by the sap, and within a week all the larvae had been driven out, so that no further damage occurred. Apparently the larvae disliked the bitter taste of the wood and immediately bored out through the bark. Until this or some other method of control has been satisfactorily worked out, infested shade trees should be destroyed in the autumn or winter while the larvae are still inside in order to protect surrounding trees.

NEWELL (W.). **Report of the Plant Commissioner for the Biennium ending June 30th, 1926.**—*Qtrly. Bull. State Plant Bd. Florida*, xi, no. 2, pp. 21-110. Gainesville, Fla., January 1927.

This is a general discussion of the work of the State Plant Board, with recommendations for the improvement of existing quarantine measures. Mosaic disease is spreading in spite of quarantine measures, and it is only a matter of time for the whole cane-growing area to be involved. A list of pests intercepted during the period under review is appended.

COMPÈRE (H.) & SMITH (H. S.). **Notes on the Life-history of two Oriental Chalcidoid Parasites of *Chrysomphalus*.**—*Univ. Cal. Pubns. Ent.*, iv, no. 4, pp. 63-73, 13 figs., 4 refs. Berkeley, Cal., 24th January 1927.

In China and Japan, *Chrysomphalus aurantii*, Mask. (California red scale) and *C. aonidium* L. (Florida red scale) are attacked by the Eulophid, *Casca chinensis*, How., which also attacks *Lepidosaphes beckii*, Newm. (purple scale), and by the Encyrtid, *Comperiella bifasciata*, How. Shipments of these two parasites were sent to California by Silvestri [cf. *R.A.E.*, A, xv, 123]. In California *C. bifasciata* failed to breed on *C. aurantii*, eggs that were laid in the scales failing to hatch, although there does not appear to be any morphological difference between the Japanese and Californian races of this Coccid, but it was successfully reared, and has since been established in two localities, on *C. aonidium* on *Aspidistra*. *C. aonidium* is, however, a pest of minor importance in California, where it is sometimes abundant on *Aspidistra* but never attacks *Citrus*, even when the two plants are growing together. *C. bifasciata* is therefore unlikely to prove of much value in California, where *C. aonidium* is the only host that it is able to parasitise successfully, but it has been sent to Florida and may be very valuable in other countries where *C. aonidium* is a serious pest of *Citrus*.

The eggs of *C. bifasciata* are normally laid singly in mature scales and hatch in about four days; the larvae moult at least four times and pupate within the host about ten days after hatching. The immature stages and method of oviposition are described. Large numbers of the Eulophid, *Marietta carnesi*, How., emerged from scales supposed to be infested with *C. bifasciata*, on which it is probably parasitic. *Casca chinensis* was bred in the insectary on *Chrysomphalus aonidium* infesting *Aspidistra*, but has apparently failed to become established in localities where adults were liberated on trees infested with *C. aurantii*. The eggs are described; from four to six are laid in each scale.

HAWLEY (I. M.). **The Pear Leaf Blister Mite as an Apple Pest.**—*Utah Agric. Expt. Sta.*, Bull. 197, 13 pp., 2 figs., 3 refs. Logan, Utah, June 1926. [Recd. March 1927.]

*Eriophyes pyri*, Pagnst., has become a serious pest of apples in the Western United States during recent years. The author believes that the mite on apple is identical with the pear-leaf blister-mite, though infested apple trees are often found near pear trees that remain unattacked. The stages of the mite are described, and the type of injury and life-history are discussed [cf. *R.A.E.*, A, xiii, 328]. The mite migrates from the bud scale as it opens, and hollows out a cavity in the lower surface of a new leaf, in which it feeds and grows, thereby forming a gall or blister in which the female deposits her eggs. The young mites eventually leave the gall and make new ones on the same or another leaf. The first damage to apple foliage was observed late in May, while a few mites still remained in the leaves late in October. There are several broods during the summer. It was originally believed that low temperatures in January resulted in light infestations, but an abundance of blister-mite in the summer of 1925 had been preceded by abnormally low winter temperatures.

Spraying experiments were carried out during 1922-1924, in the spring, both before the buds had begun to swell and later when the green tips had appeared, and in the autumn. In every case lime-sulphur gave almost complete control, miscible oils and lubricating oil emulsions being much less satisfactory. Lubricating oil appears to be considerably less effective, even at 6 or 7 per cent., than the miscible oils. One explanation of the action of lime-sulphur that has been suggested is that the sulphur fumes that are given off over a long period by the spray mixture on the trees kill the young mites soon after they leave the protecting bud scales. If this were the case, lime-sulphur applied in the autumn would not be effective till the following spring. Experiments have shown, however, that autumn applications of lime-sulphur are effective, suggesting that the sulphur fumes penetrate the closed buds and kill the mites there. Oil sprays kill by coming into actual contact with the mites and should therefore not be applied before the buds swell and the scales separate.

Spring spraying with liquid lime-sulphur, 1:11, or dry sulphur compounds at the rate of 15 lb. to 50 U.S. gals. water is recommended where *E. pyri* is the main pest, and applications should be made not later than the stage where the buds show green tips, as the small mites are less easily reached when the leaves have separated. If *Aspidiotus perniciosus*, Comst. (San José Scale) is also present, the dilution used should be 1:8, and if eggs of *Tortrix* (*Archips*) *argyrospila*, Walk. (fruit-tree leaf-roller) are abundant, a miscible oil spray at 8 per cent. or a lubricating oil emulsion at 7-8 per cent. should be applied. Great importance is attached to thoroughness in spraying.

HOUGH (W. S.). **The Codling Moth and its Control.**—*Proc. 31st Ann. Mtg. Virginia State Hort. Soc.*, 7-9 Dec. 1926, pp. 128-130. Charlottesville, Va., February 1927.

Observations in May and June in Virginia showed that of 325 eggs of the first brood of the codling moth [*Cydia pomonella*, L.] only 6 per cent. were laid on the apples, the remaining 94 per cent. being laid on the leaves. On the average the young larvae wandered about for 48 minutes before settling on the fruit, and of that time 31 minutes were spent on the leaves, almost entirely on the lower surface. Even some of the larvae that emerged from eggs laid on the fruit wandered over the leaves for an average period of 8 minutes. Some of the larvae actually feed on the leaves. The presence of poison on the leaves therefore increases the possibility of the larvae receiving a fatal dose of lead arsenate before they reach the apples, and if spraying is done thoroughly enough to coat the lower surface of the leaves, the fruit will also be covered. There is more lead arsenate to a unit area of sprayed surface when the coating is heavy and spotted than when the spray dries in a thin film, and it is more likely to produce rough areas. Roughness appears to stimulate the young larvae to action; they have been found attacking such places whether due to dried spray drops or scars on the apple skin.

The type of spraying machinery most suitable for producing the desired force and concentration is discussed.

Oil sprays are not recommended. The overwintering larvae in the cocoons will survive for 15 hours when submerged in an oil spray diluted for winter spraying, while summer applications against the eggs require frequent repetition and form an oil film over the lead arsenate,

so that very little of the poison is washed off before the fruit is picked. The use of spreaders increases the adhesiveness of the spray and enhances the problem of the spray residue, but does not decrease the amount of injury caused by the larvae.

ALDRICH (J. M.). **A New Species of *Oedematocera* reared from the Tropical Migratory Locust (Diptera).**—*Proc. Ent. Soc. Washington*, xxix, no. 1, pp. 17–18. Washington, D.C., January 1927.

The Tachinid, *Oedematocera dampfi*, sp. n., has been reared from *Schistocerca paranensis*, F., in Mexico and Guatemala.

GREENE (C. T.). U.S. Bur. Ent. **The Larva and Pupa of *Oedematocera dampfi* Aldrich (Diptera).**—*Proc. Ent. Soc. Washington*, xxix, no. 1, pp. 18–19, 1 fig. Washington, D.C., January 1927.

The larva and pupa of *Oedematocera dampfi* are described.

ROHWER (S. A.). U.S. Bur. Ent. **A New *Tiphia* from Korea (Hym.).**—*Proc. Ent. Soc. Washington*, xxix, no. 1, pp. 19–20. Washington, D.C., January 1927.

In describing *Tiphia autumnalis* [R.A.E., A, xii, 301] from material received from Japan it was erroneously stated that this species oviposits on the thorax of *Anomala* and successfully attacks the larvae of *Popillia japonica*. The parasite to which this information should apply is here described as *T. koreana*, sp. n., parasitic on *A. sieversi*.

HAYES (W. P.). **Another Host of *Pristocerca armifera* (Say) (Hymenoptera: Bethyridae).**—*Proc. Ent. Soc. Washington*, xxix, no. 1, pp. 20–22, 1 ref. Washington, D.C., January 1927.

*Pristocerca armifera*, Say, previously recorded from *Limonijs agonus*, Say, in Vermont, is now recorded from another wireworm, probably *Aeolus elegans*, F., in Kansas.

HOOD (J. D.). ***Gryllus domesticus* Linn., as a Household Pest in Rochester, N.Y. (Orthoptera: Gryllidae).**—*Proc. Ent. Soc. Washington*, xxix, no. 1, pp. 22–23. Washington, D.C., January 1927.

The occurrence of *Gryllus domesticus*, L., in houses is discussed, and a list of the States in which it occurs is given; these include Louisiana, Maryland and the District of Columbia, from which it has not previously been recorded.

GIBSON (A.). **International Entomology—Retrospective and Prospective.**—*Jl. Econ. Ent.*, xx, no. 1, pp. 47–62, 1 ref. Geneva, N.Y., February 1927.

Some of the developments, particularly during the last decade, that have assisted in bringing about a spirit of co-operation in international entomological problems are reviewed. The close co-operation maintained between the United States and Canada with regard to such pests as the gipsy moth [*Porthetria dispar*, L.] and the European corn borer [*Pyrausta nubilalis*, Hb.], and the value to all countries of such organisations as the International Institute of Agriculture in Rome and the Imperial Bureau of Entomology in London, are discussed; and

the importance of future developments relating to the biological control of insects, national collections of insects, interchange of workers, etc., is pointed out.

FELT (E. P.). **Insect Pests Newly Established in New York State.**—*Jl. Econ. Ent.*, xx, no. 1, pp. 63–67. Geneva, N.Y., February 1927.

During the summer of 1926 *Popillia japonica*, Newm. (Japanese beetle) occurred in considerable numbers in various localities in Staten Island and in the western extremity of Long Island. The remedial measures have been thoroughly investigated in New Jersey [cf. *R.A.E.*, A, xv, 144], but it must be admitted that the spread of this pest can at best only be retarded. The beetle is established at least 50 miles from previously known infested areas and may be expected to make somewhat rapid progress up the Hudson Valley. *Anomala orientalis*, Waterh., is more local in habit than *P. japonica* and not so destructive to foliage, though it feeds to some extent on blossoms, particularly roses. The larvae when numerous are injurious to turf. *Aserica castanea*, Arrow, was erroneously identified in 1923 as *Serica parallela*, Casey; the larvae at that time were associated with serious damage to lawns, while the adults injured small garden plants. This pest also occurs in northern New Jersey.

Other insects discussed are: *Fenusa pumila*, Klug (birch leaf-miner), generally not considered a serious pest; *Porthetria dispar*, L. (gipsy moth), the westward spread of which was prevented by the erection of a barrier zone in 1923; *Diarthronomyia hypogaea*, Lw. (chrysanthemum midge), which may cause serious damage in green-houses; *Pyrausta nubilalis*, Hb. (European corn borer), which is spreading rapidly, particularly in the western area; *Diprion simile*, Hart. (imported pine sawfly); *Hemerophila pariana*, Clerck (apple and thorn skeletoniser), which usually has three generations a year and may easily be controlled by the usual spraying for orchard pests; *Cydia (Laspeyresia) molesta*, Busck (oriental peach moth), the status of which as a pest in New York has not yet been determined; *Vespa crabro*, L. (European hornet), which is of little economic importance; *Rhyacionia (Eveltria) buoliana*, Schiff. (European pine-shoot moth), which is widely distributed throughout the State and causes slight damage to ornamental plants; *Monarthropalpus buxi*, Labl. (box midge), which is generally distributed where box is grown and causes serious damage in some localities; *Forficula auricularia*, L. (European earwig), which has become well established without being a serious pest; *Physokermes piceae*, Schr. (spruce bud scale), which occurs in bud-like clusters in the forks of the smaller branches of spruce, and is apparently responsible for the death of the twigs; and *Colcophora (Haplotilia) limosipennella*, Dup. (European elm case-bearer), which is somewhat generally distributed in the Hudson Valley and occasionally causes severe injury to European elms on Long Island.

BURGESS (A. F.). U. S. Bur. Ent. **Some Problems in Economic Entomology.**—*Jl. Econ. Ent.*, xx, no. 1, pp. 67–68. Geneva, N.Y., February 1927.

In this paper, of which only an abstract is published, the author points out the importance of securing information on the bionomics

of foreign pests that might be introduced into the United States, very little attention having been given to such work in the past. The value of mutual assistance and co-operation between Federal, State and Provincial workers is also discussed, and it is suggested that the American Association of Economic Entomologists should act as the clearing house where all entomologists can freely exchange views and arrive at a common understanding. The future development of the Association should increase its effectiveness in this respect.

DUSTAN (A. G.). **The Artificial Culture and Dissemination of *Entomophthora sphaerosperma* Fres., a Fungous Parasite for the Control of the European Apple Sucker (*Psyllia mali* Schmidb.).**—*Jl. Econ. Ent.*, xx, no. 1, pp. 68-75, 5 figs. Geneva, N.Y., February 1927.

The information contained in this paper on the employment of *Entomophthora sphaerosperma* for the control of *Psylla* (*Psyllia*) *mali*, Schmidb., in Canada has already been noticed from other sources [*R.A.E.*, A., xiii, 188, 496, 581].

MANTER (J. A.). **Charts and Forms as Aids in Teaching Economic Entomology.**—*Jl. Econ. Ent.*, xx, no. 1, pp. 76-78. Geneva, N.Y., February 1927.

It is doubtful whether the teaching of entomology has reached so high a standard on the average as the teaching of some of the other sciences. It is desirable that arrangements should be made for an interchange of ideas and discussion of the problems of those engaged in such work. With the object of initiating this, the author describes a number of charts and forms that have proved of value to students at the Connecticut Agricultural College.

ROBINSON (W.). **Water Binding Capacity of Colloids a Definite Factor in Winter Hardiness of Insects.**—*Jl. Econ. Ent.*, xx, no. 1, pp. 80-88, 5 figs., 9 refs. Geneva, N.Y., February 1927.

The following is the author's summary of this paper: Colloidal particles which occur in protoplasm and intercellular liquids will adsorb free water under a falling temperature. The water thus bound ceases largely to function as ordinary free water. The direct correlation between winter hardiness of wheat plants and percentage of bound water observed by Newton and Gortner (1922) has been found to hold for cold-blooded animals such as insects. When a hardy, a moderately hardy and a non-hardy species were tested, the percentage of water adsorbed was found to be in direct proportion to their winter hardiness. The biological significance and the advantages to the species of having their free water changed into bound form upon the approach of winter is discussed; and the method of making determinations is described.

Depression of freezing point of body liquids does not always accompany the hardening process. This is due in part to the sign of the electric charges on the particles and on the salts in solution. Adsorption is a physical process, and is due to energy exerted to reduce interfacial tension, which is affected by low temperatures. When equilibrium is established adsorption will cease. The percentage of

water bound by the insect before equilibrium is reached is of importance in the hardening process. The suggestion is made of including studies of water-binding and water-holding capacities in low temperature work.

CAMPBELL (F. L.). **Notes on Silkworm Nutrition.**—*Jl. Econ. Ent.*, xx, no. 1, pp. 88–90. Geneva, N.Y., February 1927.

There are three possible explanations for the tendency of many insects to restrict their diet to the foliage of one or a few species of plants. It may be mechanically impossible for the insect to feed on leaves differing structurally from those of the chosen food-plant; the stimuli requisite for setting the feeding mechanism in action may only be supplied by certain plants, or if the insect attempts to eat, the repellent taste may prevent further feeding; or foliage not normally consumed may not be suitable for the maintenance of the insect and may even exert a toxic effect. In order to test these possibilities preliminary experiments were made with *Bombyx mori*, L. It was thought that the leaf thickness might be one of the physical factors limiting the food-plants of this insect, but the larvae readily fed on double leaves prepared by moistening two pieces of mulberry leaf and pressing them together. The larvae would not eat *Ailanthus* leaves alone, and though they attacked the double margin when a leaf was pressed to a mulberry leaf, they were soon repelled, apparently owing to the taste. It appears to be impossible to devise a method of testing, by artificial feeding, the food-value of leaves on which the silkworm will not feed naturally. In the case of liquids, however, it was found that if a drop of fluid is placed on the mouth-parts of a silkworm, it is usually imbibed. Initial experiments were, therefore, made with cow's milk, as it was thought that if a liquid so foreign to the nutrition of a phytophagous insect should prove adequate in any degree for the maintenance of its life, a more suitable nutritive liquid might be prepared. It was found that milk-fed larvae lived somewhat longer than starved or water-fed individuals. Further use of this method for studying insect nutrition might lead to a qualitative and even a quantitative knowledge of the food components essential for the growth and maintenance of certain insects.

In commenting on this paper N. E. McIndoo stated that silkworms could easily be induced to eat leaves that they do not feed on normally by wetting them in the juice of mulberry leaves.

GRISWOLD (G. H.). **Observations on the Biology of a new Geranium Aphid** (*Macrosiphum cornelli*, Patch).—*Jl. Econ. Ent.*, xx, no. 1, pp. 91–94, 4 refs. Geneva, N.Y., February 1927.

The only food-plants on which *Macrosiphum cornelli*, Patch [*R.A.E.*, A, xiv, 638] has been observed are species of *Pelargonium*, but it has never been found to feed upon the commonest geranium, *P. hortorum*. Details of the feeding habits and life-history in greenhouses are given. Only viviparous females have hitherto been observed, reproduction taking place throughout the year. Aphids reared on leaves in water matured in 9–11 days and began to produce young 24 hours later, the average number produced by an individual being 35.6, while those reared on growing plants developed more slowly and produced fewer young.

The parasites reared from *M. cornelli* were the Braconid, *Praon simulans*, Prov., the larva of which spins a cocoon beneath the body of its host, and three Chalcids, *Aphelinus jucundus*, Gahan (a parthenogenetic species, the larva of which pupates in the body of its host), *A. semiflavus*, How., and *Aphidencyrthus inquisitor*, How., which is probably a hyperparasite, attacking *A. jucundus*.

A 2 per cent. free nicotine dust kills 90 to 100 per cent. of the Aphids. Alternative methods of control are fumigation with calcium cyanide  $\frac{1}{4}$  oz. to 1,000 cu. ft., and a spray of 1 teaspoonful nicotine sulphate and 1 oz. soap to 1 U.S. gal. water, in which the plants may also be dipped.

BROADBENT (B. M.). U.S. Bur. Ent. **Further Observations on the Life History, Habits, and Control of the Narcissus Bulb Fly, *Merodon equestris*, with Data on the Effects of Carbon Disulphide Fumigation on Three Bulb Pests.**—*Jl. Econ. Ent.*, xx, no. 1, pp. 94–113, 1 ref. Geneva, N.Y., February 1927.

Considerable progress has been made since November 1925 in working out details of the biology of *Merodon equestris*, F. [*R.A.E.*, A, xiv, 452]. The following is taken from the author's abstract of this paper: The larval stage lasts 10 months. Pupation occurred between 25th March and 17th April 1926 and lasted 5–7 weeks. The adults emerged between 8th and 22nd May, their average length of life being about 16 days, with a maximum of 4 weeks. Each female laid nearly 100 eggs, which hatched in 10–14 days. Details of various phases of the life-history are tabulated, and notes are given showing the relative infestation of imported narcissus bulbs with larvae of *M. equestris*, *Eumerus strigatus*, Fall. (lesser bulb fly), and *Rhizoglyphus hyacinthi*, Banks (bulb mite).

Preliminary data are presented in tables showing the effects of fumigation with carbon bisulphide under normal atmospheric pressure on larvae of both bulb flies and on the bulb mite, as well as on the subsequent growth and flowering of the bulbs, at dosages ranging from 10–30 lb. to 1,000 cu. ft. with exposures lasting 2, 12 and 23½ hours. The results proved quite decisive and serve to suggest the range of effectiveness of this chemical as a bulb fumigant. The 10 lb. dosage with an exposure of 2 hours was equally ineffective under a 27-inch vacuum and under normal atmospheric pressure, but neither treatment affected the growth and flowering of the bulbs. Dosages of from 10 to 30 lb., with exposures of 23½ hours, killed all the larvae of both species of flies and about 90–99·4 per cent. of the mites; but dosages of from 20 to 30 lb. proved fatal to the bulbs, causing a characteristic brownish discolouration of the basal plate. These results suggest the possibility of finding a range of lower dosages and shorter exposures that will kill these pests without injuring the bulbs.

WEIGEL (C. A.). U.S. Bur. Ent. **Hot-Water Bulb Sterilizers.**—*Jl. Econ. Ent.*, xx, no. 1, pp. 113–125, 6 refs. Geneva, N.Y., February 1927.

The various types of sterilisers used for the treatment of narcissus bulbs imported under special permit and in accordance with the requirements of the Federal Horticultural Board are discussed. The object of the restrictions is to prevent the further introduction of

*Merodon equestris*, F. (narcissus fly), *Eumerus strigatus*, Fall. (lesser bulb fly), and *Tylenchus dipsaci*, Kühn (bulb Nematode). Most of the sterilisers were more or less satisfactory, the features incorporated in the construction of the most efficient ones being summarised by the author as follows: Provision for keeping the water in motion, either by propulsion or circulation. The temperature control device, whether manual or automatic, should be capable of maintaining the temperature accurately within closely prescribed limits. The source of heat energy, whether electricity, or steam or hot water boilers, heated by gas, oil, coal or wood, must be of sufficient capacity to bring the entire volume of water up to the critical temperature as rapidly as possible. If of sufficient capacity to do this, it will, obviously, also be capable of maintaining a constant temperature. Efficient insulation is needed, to prevent too rapid a loss of heat by radiation. The treating capacity should be adequate to handle within a reasonably short period of time the stock of bulbs to be treated.

SMITH (F. F.). **The Black Vine Weevil** (*Brachyrhinus sulcatus*, Fabr.) **as a Pest in Greenhouses and Nurseries.**—*Jl. Econ. Ent.*, xx, no. 1, pp. 127–131. Geneva, N.Y., February 1927.

*Otiorrhynchus* (*Brachyrhinus*) *sulcatus* (black vine weevil) has been known in the northern United States and Canada since 1890 as being injurious to various plants, including cyclamens, primroses and gloxinias in greenhouses and strawberries and *Taxus* (yew) out of doors. Observations point to the possibility of distribution by means of balled nursery stock, and infested *Taxus* has been found growing in the neighbourhood of greenhouses in eastern Pennsylvania where hothouse plants had been injured by the weevil. Life-history studies indicate that greenhouse plants are infested by adults developing out of doors, as the clearing out of the houses by spring sales renders conditions unfavourable for continuous breeding, the young plants not providing sufficient food for larval development.

Adults emerged from 16th to 29th June from larvae taken from roots of *Taxus* out of doors on 7th May and began oviposition about 20th July, the greater part of the eggs being laid in August and a few in September. These eggs were transferred to primroses and cyclamen plants in the greenhouse, where the larval stage was completed in 3½ to 4 months. Adults transferred to the greenhouse laid an average of 342 eggs each, whereas those out of doors laid an average of 138. Larvae maturing on cyclamen in November and December produced adults in January and February, oviposition beginning 67 days later in April and lasting till October. The period from egg to adult under greenhouse conditions was 5½–6 months, and the maximum number of eggs laid by one adult was 1,085. Larvae began to mature in July and continued until late autumn.

This weevil is probably parthenogenetic, as at least one generation can develop in the absence of males, no specimens of which were found among the numerous adults examined. The eggs, which are found in soil crevices, hatch in 15–21 days, 8–11 per cent. failing to hatch. The larvae, which enter the ground in search of roots, have difficulty in penetrating heavy soil and only flourish in districts where it is light and porous. The greatest damage is done about the third instar, when the larvae attack the larger roots. Pupation takes place two inches

from the soil surface or deeper in the case of potted plants. Cultivation during May is likely to break up the pupal cells, which are easily injured at this stage. The pupal stage lasts ten days, but the adult remains in the pupal cell for another week. It cannot fly and feeds only at night, hiding among plant stems during the day.

For greenhouse plants soil treatment with 8-16 oz. of dry lead arsenate to a bushel of soil appears most effectual. A lower strength had little effect when applied later than the third instar. Baits composed of dried apple waste coated with 5 per cent. of either magnesium arsenate or dry lead arsenate were successful in cage tests against the adults, but did not attract them from large plants of *Taxus* when placed on the ground below.

CLEVELAND (C. R.). **Stomach Poisons for Control of the Squash Vine Borer** (*Melittia satyriniformis* Hbn.).—*Jl. Econ. Ent.*, xx, no. 1, pp. 135-143. Geneva, N.Y., February 1927.

Until recently it has been considered that *Melittia satyriniformis*, Hb. (squash vine borer) could not be controlled by the use of insecticides, especially stomach poisons. The larvae are only exposed to their action when they eat their way into the stems immediately after hatching from the eggs, which are usually laid on the stems near the bases of the plants. Tests were, however, made during the summers of 1924-26, and though they were carried out on a small scale, the consistency of the results seems to justify positive conclusions.

The insecticides tried included sprays containing lead arsenate and dusts containing sodium fluosilicate and various arsenicals. Of these a spray of 1½ lb. lead arsenate to 50 U.S. gals. Bordeaux mixture gave decidedly superior results. The degree of control obtained depends on the adhesiveness of the material and time and thoroughness of application. Four applications, at 5-6 day intervals, are necessary, beginning shortly after the plants appear above ground. The intervals depend on weather conditions; a fresh application should always be made after heavy rain.

Late planting, though an effective remedial measure, is not practical under conditions prevailing in central Indiana, as only a poor crop matures.

RIES (D. T.). **The Apple Maggot in Michigan**.—*Jl. Econ. Ent.*, xx, no. 1, pp. 144-146. Geneva, N.Y., February 1927.

The apple maggot, *Rhagoletis pomonella*, Walsh, caused widespread and serious damage in 1924 and 1925 to orchards in Michigan after having been of little importance since 1900. Life-history studies begun in 1925 show that adults emerge about 13th July and are abundant till the end of August, oviposition beginning about two weeks after emergence. The eggs are laid just below the surface of the skin of the apple, and the spots left from the oviposition punctures, which sometimes enlarge with the growth of the fruit, may be confused with injury by other insects. The larvae hatch in 2-7 days and are full-fed in 13-27 days or even longer according to the variety of apple and the temperature. Larvae from eggs deposited on one variety on 23rd August were only half-grown by 1st November. Although the presence of the maggots generally causes the fruit to ripen prematurely and fall to the ground, where the larvae quickly emerge to pupate in the soil, in the case of one variety of fruit the emergence holes of the larvae were

found in the sides of decaying apples still hanging on the tree. Some maggots may also pupate in tunnels in the fruit. About one-third of the maggots entering the ground emerge to form a second generation the same year, the adults of which oviposit in late winter apples, while it is probable that some of the puparia lie over for two years instead of giving rise to adults the following spring.

PARROTT (P. J.) & HARMAN (S. W.). **The Peach Cottony Scale.**—*Jl. Econ. Ent.*, xx, no. 1, pp. 146–150. Geneva, N.Y., February 1927.

A Coccid, variously identified as *Pulvinaria amygdali*, Ckll., and *P. vitis*, L., caused considerable damage to peach trees in New York State on the shores of Lake Ontario in 1925. The pest, which must almost certainly have been present on the trees in 1924, completely escaped attention in that year. Although it closely resembles *P. vitis* (maple cottony scale), maple trees in the neighbourhood of infested peach orchards were found to be comparatively free from the pest. Specimens of *P. amygdali* from Georgia and California, however, show differences from the form occurring on peach in New York. Other food-plants of the latter are quinces, plums and prunes; apple and pear foliage in close proximity to peach plantings was sometimes infested by the larvae, but they did not appear able to become established. Although the Coccid breeds freely on several varieties of peach, difficulty was experienced in colonising the larvae on one variety. From 800 to 3,000 eggs are produced by one insect, hatching beginning in 1925 about the middle of June and apparently terminating about 1st July. In 1926, in consequence of the cool summer, these dates were a fortnight later, and correspond approximately to the activities of *P. vitis* reported previously from New York and Ohio. The health of the trees is affected and the fruit becomes blackened and unmarketable. *Cocco-phagus lecanii*, Fitch, was found to be a common parasite, and its activities, together with the high mortality of the hibernating forms, render it unlikely that this Coccid will prove a permanent pest of primary importance.

Lime-sulphur, 1 : 8, as a dormant spray did not prove very effective against this scale, but satisfactory control was obtained with lubricating oil emulsions and proprietary miscible oils diluted to give an oil content of 4 per cent., when applications were made in the spring as the buds were swelling. Autumn applications appear equally effective. The larvae and young scales proved susceptible to summer applications of commercial white oil emulsions containing 2 per cent. oil, though the eggs were resistant. Peach trees receiving either two or three treatments with white oil emulsions for two successive years have so far shown no indication of injury, except when the spray was used in combination with copper or sulphur compounds or following an application of sulphur mixtures.

WEED (A.). **Metamorphosis and Reproduction in Apterous Forms of *Myzus persicae* Sulzer as influenced by Temperature and Humidity.**—*Jl. Econ. Ent.*, xx, no. 1, pp. 150–157, 2 figs. Geneva, N.Y., February 1927.

*Myzus persicae*, Sulz., has been reared through two winters in the greenhouse and in chambers that enabled a constant temperature and

humidity to be maintained. The temperatures used varied from 10 to 28° C. [50–82.4° F.] and the relative humidity from 60–85 per cent.

The technique employed is described in detail, and the following conclusions are drawn from the experiments: There is a definite response in *M. persicae* to changes in temperature and humidity, an increase or decrease of either acting as a stimulus. Activity is increased by a rise in temperature and humidity, but when the temperature approaches 28° C. [82.4° F.] and the humidity 85 per cent., inhibition occurs. The converse occurs with extreme low ranges. With a rise in temperature and humidity the rapidity of growth is increased, and reproduction is accelerated. With these conditions the greatest number of individuals are produced, not only on a daily basis, but also for the life of the individual, and the time required for the newly born Aphid to reach maturity is materially lessened. With a diminution of temperature and humidity, reproduction is inhibited and the rapidity of metamorphosis is reduced. Also, reproduction persists for a greater duration of time, and the individuals live considerably longer.

HEADLEE (T. J.). **An Operation in Practical Control of Codling Moth in a Heavily Infested District.**—*Jl. Econ. Ent.*, xx, no. 1, pp. 158–166. Geneva, N.Y., February 1927.

This paper gives an account of one year's work against *Cydia* (*Carpocapsa*) *pomonella*, L. (codling moth) carried out by a group of 11 growers in co-operation with the State entomologist in a severely infested area in New Jersey. The treatment applied included scraping of all old rough-barked trees and the application of burlap bands, the removal or adequate treatment of used baskets normally stored within or near the properties treated, and spraying. Owing to the abundance of eggs of the European red mite [*Paratetranychus pilosus*, C. & F.] the delayed dormant spray consisted of oil emulsion, the pink-bud spray consisted of commercial lime-sulphur and lead arsenate, and the blossom fall spray and the next spray, 7 days later, consisted of dry-mix and lead arsenate according to the usual formula. The cover sprays for the first brood entering the side of the fruit consisted of dry-mix with powdered lead arsenate at the rate of 2 lb. to 50 U.S. gals. with an adhesive. The adhesive was omitted in the cover sprays against the second brood, the dry-mix was reduced, and only 1½ lb. of lead arsenate powder was used to 50 U.S. gals. The cover sprays should be applied as soon as an appreciable number of moths are caught in bait pans, this being the only reliable means of timing the spray. After this first year's work 68.8 per cent. of the apples were absolutely free from injury by the codling moth, which represents an increase of 20.5 per cent. The author considers that if such measures are carried out until 90 per cent. of the picked fruit is free from injury (the work is to be continued for two more years), it will afterwards be possible to control *C. pomonella* by applying the regular schedule and cover sprays for the first brood only.

FROST (S. W.). **Further Studies of Baits for Oriental Fruit Moth Control.**—*Jl. Econ. Ent.*, xx, no. 1, pp. 167–174, 2 figs. Geneva, N.Y., February 1927.

Experiments on baits for *Cydia* (*Laspeyresia*) *molesta*, Busck, in Pennsylvania [*R.A.E.*, A, xiv, 447] have been continued. From 5–10

test pails of about 1 U.S. gal. capacity, painted white inside and out, were used, half-filled, for each variety of bait, all being placed in the same block of peach trees and subjected to weekly examinations. The pails were hung on every other tree in alternate rows, and nothing was added to their contents except water to compensate for evaporation. The 1926 infestation was lighter than that of 1925, and the degree of parasitism was less. The largest catches occurred between 5th and 11th May and in August with the emergence of the overwintering and second broods respectively. The large numbers of the overwintering brood were probably due to the fact that the peaches were a late variety on which the moths had concentrated at the end of the preceding season.

As regards the baits, experiments with various weak acids, of which acetic acid was the principal, proved these to be valueless at the dilution used, while stronger solutions are too expensive. No satisfactory results were obtained from volatile oils, though an odoriferous volatile oil, distilled from peach leaves, lends opportunity for further investigation. Sugars and high-grade molasses are more attractive than low-grade molasses. Larger catches of moths were secured when red engine oil was placed on the surface of the water. While fermenting baits give on the whole larger catches, the non-fermenting baits have a longer period of activity and are likely to prove more practical for control purposes. Among various substances added to sugar and molasses to hinder fermentation and prevent the development of mould, sodium benzoate 2 oz. to  $\frac{1}{2}$  U.S. gallon proved the most satisfactory. Sodium arsenite favours the growth of mould, though it is successful in preventing fermentation.

Orchard tests made with pails containing 1 part high-grade molasses and 10 parts water set on 8th June and 1st August, to which new bait consisting of granulated sugar and water was added on 10th August and 10th September respectively, showed through a series of fortnightly examinations a steady increase of infestation as the season progressed. Other insects captured with this bait include *Euphoria fulgida*, F., *Cydia* (*Carpocapsa*) *pomonella*, L., and two species of *Cotinis*.

The author considers that the 1926 studies combined with the investigations of the preceding season vindicate the merit of the bait pail as a method of control against *C. molesta*, though a more attractive bait must be found before the degree of control becomes adequate.

PETERSON (A.). U.S. Bur. Ent. **Some Baits more attractive to the Oriental Peach Moth than Black-strap Molasses.**—*Jl. Econ. Ent.*, xx, no. 1, pp. 174–185, 4 refs. Geneva, N.Y., February 1927.

A repetition of various bait experiments for the control of *Cydia* (*Laspeyresia*) *molesta*, Busck (Oriental peach moth) [*R.A.E.*, A, xiii, 252; xiv, 446] confirmed previous results in most cases. The most favourable time to make observations proved to be late June or early July, when first brood adults were present in the orchard. Two-quart enamelled stewpans or wide-mouthed quart glass jars proved the best containers, and caught more moths when well-filled and placed high in the trees. Tin or aluminium containers are unsuitable on account of the chemical reaction of fermenting bait upon the metal. Tests made with about 250 aromatic chemicals showed that only terpineol and certain essential oils are at all attractive, and even these are much less so than fermenting products that contain sugar. Various dried fruits, of which apricot is the most attractive, allowed to ferment in water

constitute good baits, the maximum catch occurring 7-14 days after the fruit is placed in the orchard. The period of attractiveness is, however, shorter than in the case of molasses and sugar baits and the total catch smaller. The chief objection to the use of black-strap molasses (5 to 20 per cent. dilutions) is the rapid fermentation and thick scum that forms over the surface and interferes with the capture of adults. The period of maximum attractiveness is also relatively short. Honey, maize syrups, refiners' syrups and brown sugar (5 to 10 per cent. solutions) produce little scum, have a longer period of efficiency, and attract more moths. The cost of honey is prohibitive, and the syrups are all considerably more expensive than black-strap molasses. Coarse maize sugar, however, is cheap and likely to prove satisfactory. Chemical analysis indicates that products having a sugar-content greater than 62 per cent. caught many more adults than similar products with a sugar content of 48-54 per cent. The author is convinced that fermentation is necessary to render baits attractive to *C. molesta*. Yeast will hasten fermentation in cold weather, but is otherwise unnecessary. Tests with various disinfectants showed that these delay but do not prevent fermentation, and few or no moths came to the baits while unfermented. Sodium benzoate 1-100 was found to be the only effective preventive. Boiled and treated baits caught a smaller number of moths than untreated and uncooked preparations. The author considers that liquid baits may prove to be ineffective in practice and advises growers to refrain from their use until more definite information is available.

STEARNS (L. A.). **The Hibernation Quarters of *Laspeyresia molesta* Busck.**—*Jl. Econ. Ent.*, xx, no. 1, pp. 185-189, 3 figs. Geneva, N.Y., February 1927.

A continuation in 1925 of the work carried out in 1924 against *Cydia (Laspeyresia) molesta*, Busck, in southern New Jersey [*R.A.E.*, A, xiii, 253], to determine the relative effectiveness of disking alone as compared with ploughing alone and as compared with these two operations combined, demonstrated the equally high efficiency of a thorough cultivation consisting of disking alone as a control measure against the moth. In order to estimate the extent of effectiveness of cultivation in the control of *C. molesta*, studies were made in 1926 to determine the relative proportion of larvae wintering upon and away from the trees. The emergence data secured from nine trees of different ages and varieties placed under cages showed that 14 per cent. of the larvae hibernate in the upper part of the tree, 11 per cent. on the trunk and 75 per cent. away from the tree. Attempts to determine the exact location of hibernacula on the tree were successful where the trunk was concerned, but in the upper part of the tree only one-third of the total number that subsequently emerged could be located. About 40 per cent. of those traced were in positions vulnerable to a drenching dormant spray. It was also determined that 88 per cent. of the larvae overwintering on the trunk constructed hibernacula within the area included in the mound formed when applying paradichlorobenzene for the control of *Aegeria exitiosa*, Say, an insecticide also toxic in the case of *C. molesta*. Although cultivation and paradichlorobenzene treatment may be relied on to destroy 86 per cent. of the hibernating larvae, there remains a sufficiently large overwintering population in the upper part of the tree to constitute a continuance of infestation from year to

year in spite of a thorough application of these measures. In view of the relatively unprotected character of these remaining hibernacula, further work with penetrating insecticides may effect the control of the insect largely, if not wholly, within the dormant period.

In the discussion that followed H. L. Dozier pointed out the great importance of picking baskets in affording hibernation quarters to *C. molesta*. An examination of 3,000 baskets in one packing house in Delaware showed an average infestation of nearly 30 larvae (of *C. molesta* and *C. pomonella*) to each basket.

CORY (E. N.) & MCCONNELL (H. S.). *Laspeyresia molesta* as an Apple Pest.—*Jl. Econ. Ent.*, xx, no. 1, pp. 190–192. Geneva, N.Y., February 1927.

*Cydia (Laspeyresia) molesta*, Busck, damaged apples in 1926 to an extent hitherto unprecedented in Maryland. The larva generally enters and leaves the fruit near the stem or calyx; its method of burrowing within the fruit is described. Examination of infested fruit from every part of the State except the extreme west showed that 31 per cent. was attacked by *Cydia pomonella*, L., and 69 per cent. by *C. molesta*. Of fruit from a local orchard that had not been sprayed for 5 years 1 per cent. was infested by *C. pomonella* and 5 per cent. by *C. molesta*. It was noticed that many eggs had been laid on the fruit itself, and that a considerable number had been parasitised.

Further instances of infestation of apples, pears and quinces by *C. molesta* were given in the discussion that followed this paper, indicating that it is the later varieties of apples that are attacked.

GUYTON (T. L.). Notes on the Occurrence of *Luperodes thoracicus* as an Insect Pest of Fruit Trees.—*Jl. Econ. Ent.*, xx, no. 1, pp. 193–194. Geneva, N.Y., February 1927.

A Galerucid, *Luperodes thoracicus*, Melsh., was reported in 1925 as having been present for three or four years in an orchard in the neighbourhood of butternut trees (*Juglans cinerea*) in Pennsylvania. In 1926 the beetles reappeared in large numbers, causing serious damage to the foliage of peach, plum and apple, the fruit of one variety of apple being slightly affected. On examination of the orchard and its surroundings several specimens of *L. thoracicus* were found on cultivated blackberries and the foliage of the butternut trees. As the regular apple spray schedule had been followed, this beetle, the life-history of which is unknown, may possibly become a serious pest, should it continue to increase in numbers.

RUNNER (G. A.) U.S. Bur. Ent. & EYER (J. R.). Experiments in the Control of the Rose-chaffer, *Macrodactylus subspinosus* Fab., in Vineyards.—*Jl. Econ. Ent.*, xx, no. 1, pp. 194–195. Geneva, N.Y., February 1927.

Only an abstract of this paper is published. Control experiments against *Macrodactylus subspinosus*, F., have been carried out during the last four years in Ohio and Pennsylvania to determine the relative values of more recently developed insecticides as compared with the ordinary mixture of lead arsenate and molasses. The tests showed that all the arsenicals tested were toxic to the beetles when used in sufficient

amounts. Caged adults were killed in 24–48 hours and vineyard infestation reduced to a minimum by a mixture of 4 lb. lead arsenate, 2 U.S. gals. molasses, and 100 U.S. gals. water, the beetles consuming toxic quantities without injuring either fruit or foliage. Lead arsenate and flour and lead arsenate coated with lead oleate also gave good results, the best control being secured by spraying when the adults first migrated into the vineyard. Many of the materials tested (nicotine, lime-sulphur, etc.) were only slowly toxic and did not protect the vines. Among these were dusts of sodium fluosilicate and hydrated lime or talc, which also scorched the foliage unless large quantities of the diluent were used. Pyrethrum soap emulsion was highly toxic and killed 80–100 per cent. of the beetles in 24 hours after spraying, without, however, protecting the vines from incoming migrants. Orthotoluidine emulsion took several days to kill caged adults. *M. subspinosus* was not attracted by bait pans containing essential oils, alcohols or fruit juices.

GARMAN (P.). **The Problem of Curculio Control in Connecticut Apple Orchards.**—*Jl. Econ. Ent.*, xx, no. 1, pp. 196–199. Geneva, N.Y., February 1927.

Counts made of fallen apples containing larvae of *Conotrachelus nenuphar*, Hbst., in Connecticut indicate that sufficient numbers occur in the early fallen fruit to produce an ample supply of adults the following year. Wild apple trees in woods surrounding the orchards are also a source of infestation. The beetles begin to emerge from the soil in the latter part of April and continue to do so well into June. This period is just about from the time the blossoms of most varieties turn pink up to at least two weeks after the petals have fallen. The beetles occur on the trees in maximum abundance at least three weeks after the calyx spray. A series of experiments have been made to test the effect of leaving out one after another of the sprays in the schedule. The results indicate the advantage of applying a spray seven days after the calyx spray. It is probable, however, that such an additional spray is only justified in the case of the best varieties of fruit and a large crop.

The spray used in most of these experiments was composed of 3 lb. lead arsenate, 1 U.S. pt. nicotine sulphate, 1 lb. casein-lime, 6 lb. lime-sulphur (dry) and 100 U.S. gals. water.

A plain lead arsenate spray was also used at the calyx period with 1 U.S. qt. fish-oil as an adhesive, and the results were so promising that it may be found possible to eliminate at least one of the subsequent sprays.

QUAYLE (H. J.). **Cyanide Dust Fumigation.**—*Jl. Econ. Ent.*, xx, no. 1, pp. 200–203. Geneva, N.Y., February 1927.

The recent developments in fumigation with calcium cyanide are briefly reviewed. During the past year a new compound, "citro-fume," has appeared. It is practically a pure calcium cyanide, formed by combining liquid hydrocyanic acid with calcium carbide, and contains 30 per cent. HCN. On exposure to the air hydrocyanic acid gas is given off rapidly. When blown under a tent 93 per cent. of the gas was liberated within 5 minutes, 98 per cent. in 20 minutes, and 99 in 45 minutes. The relative humidity was 57–58 per cent. and

the temperature 71–74°F. At a relative humidity of 20–22 per cent., 90 per cent. of the gas was liberated in 5 minutes; the low relative humidity has no marked effect on the evolution of the gas from citrofume, but it considerably retarded its evolution from cyanogas calcium cyanide. Field tests have shown that 1½ oz. of calcium cyanide (30 per cent. HCN), so far as the actual mean gas concentration and the kill of scale under a tented tree are concerned, are equal to 20 cc. of liquid hydrocyanic acid of 97–98 per cent. purity and to about 1 oz. of sodium cyanide (51–52 per cent. cyanogen). Besides the rapid evolution of the gas, the advantages of citrofume as compared with liquid HCN are its fine state of division, which ensures good distribution under the tent, and the fact that the residue is practically harmless to the trees. It can also be stored and kept indefinitely in airtight containers, and is safe to handle and transport. Another grade of calcium cyanide, “calcyanide,” carrying 50 per cent. of HCN, has been tested to some extent for citrus fumigation; it is primarily prepared for warehouse fumigation. The evolution of the gas is more rapid than with the lower grade material containing 30 per cent., and it would probably be preferable even for citrus fumigation, as there would be less bulk to handle.

HARTZELL (A.) & WILCOXON (F.). **The Arsenic Content of Sprayed Apples.**—*Jl. Econ. Ent.*, xx, no. 1, pp. 204–212, 16 refs. Geneva, N.Y., February 1927.

In view of the recent anxiety in England regarding the safety of sprayed fruit for human consumption, experiments have been made to ascertain the arsenic content of sprayed apples. Previous literature on the subject is reviewed. In the experiments the spray materials and time of applications were made to conform as nearly as possible to those usually recommended in New York. The climatic conditions for 1926 and the method of analysing the fruit are described.

The authors' abstract is as follows:—Individual analyses of 47 apples from trees sprayed according to the standard spray schedule comprising 5 applications of lead arsenate (4 lb. to 150 U.S. gals.) at Yonkers, New York, during the season of 1926, gave an average of 0.173 mg. of arsenic trioxide per kg. of fruit and a maximum of 0.704 mg. per kg. The quantity allowed by the Royal Commission on Arsenical Poisoning in 1903 was 1.429 mg. per kg. of food-stuffs. There was between 17.85 and 19.51 inches of rainfall from the time the first spray was applied until the date the fruit was picked. Analyses of cider (50 cc.) and jelly (30 g.) made from apples from this experiment showed arsenic in such minute quantities that the determinations did not differ from the blanks of the reagents by any measurable amount.

BARNES (D. F.) & POTTS (S. F.). U.S. Bur. Ent. **Airplane Dusting Experiment for Gipsy Moth Control.**—*Jl. Econ. Ent.*, xx, no. 1, pp. 213–222, 1 fig., 1 ref. Geneva, N.Y., February 1927.

These experiments were carried out in 1926 in Massachusetts, where 6 plots of 25 acres each were selected to give as great a variation as possible in terrain and tree growth. Observations on a typical plot made at the height of feeding showed that in spite of egg and larval parasitism there were enough larvae of the gipsy moth [*Porthetria*

*dispar*, L.] to have completely defoliated the plot if no treatment had been given. The trees were mostly oaks with occasional pines and varied from 10 to 30 ft. in height.

The first application was made on 11th June, when about 55 per cent. of the larvae were in the third instar, lead arsenate dust being distributed at the rate of 40 lb. an acre. The aeroplane flew from 10 to 30 ft. above the trees with an average of about 15 feet. The lower altitudes gave the better results. In spite of satisfactory conditions, it was estimated that about 20 per cent. of the poison settled outside the treated area. The distribution on individual trees was uniform from top to bottom. The trees on higher and more level ground received more poison than the deep depressions. As about 75 per cent. of the poison was washed off the foliage by rain on 14th June, a second application was made on 19th June. Three days after the first application most of the larvae of the second instar and many of the third instar were dead, but the mortality in the later instars was small. At the time of the second application about 85 per cent. were dead, this amount increasing to 95 per cent. before pupation.

The following is taken from the authors' summary and conclusions :—The flying conditions in treating forest areas are more difficult than in dusting low-growing crops, because the trees are of varying heights. As the pilot is unable always to fly close to the trees, it is necessary to drift the dust cloud into them. The dusting must therefore be done when the wind has a low velocity, not more than 5 miles an hour, and the air has a high or strongly-rising relative humidity. These conditions occur most frequently in late afternoon. It is difficult to treat hillsides unless the wind movement is toward the slope. About 1 milligram of lead arsenate to 10 square inches of leaf surface is necessary to kill the larvae quickly under ordinary field conditions. The above-mentioned application secures this rate of distribution.

**Report of the Subcommittee on Insecticide Machinery.**—*Jl. Econ. Ent.*, xx, no. 1, pp. 223–229. Geneva, N.Y., February 1927.

The evolution of spraying machinery is reviewed. A self-mixing duster and stationary spray outfits [*R.A.E.*, A, xv, 182] are described, as well as a new type of sprayer called the "liquid duster" which applies a liquid spray in the same manner as dust is ordinarily blown on to the foliage. The economies of spraying operations and the standardisation of spray machinery are discussed.

**Report on Oil Emulsions, Dec. 27, 1926.**—*Jl. Econ. Ent.*, xx, no. 1, pp. 229–235. Geneva, N.Y., February 1927.

This report summarises the answers received to questionnaires concerning the effect of oil emulsions on various insect pests, as well as their effect on plants, and the chemical and other problems involved.

The effect of oil emulsion on the plants requires considerable study, which should be done in co-operation with plant physiologists. Dormant sprays are generally considered to be safe, unless temperatures are below freezing at the time of application. *Citrus* is more subject to injury in winter than are deciduous trees. On apple 2–4 per cent. emulsions caused no injury when applied after the buds had swollen, though some injury was reported with certain commercial

oils when used as delayed dormant sprays. It is not safe to spray peaches with oils either in the delayed dormant period or in the summer. In all cases summer applications caused some injury to apple, but as a rule the injury resulting from a 2 per cent. emulsion was negligible unless applied during very hot weather (90°F. or more). Some of the commercial oils consistently scorch the leaves and may cause severe injury. The effect of oils applied in the summer depends greatly on temperature and humidity conditions. In southern California heavy lubricating oils inhibit the blossoming and setting of the fruit of *Citrus*, and affect the rind of the fruit, as well as its shipping and keeping qualities. This type of injury, however, does not occur to any extent 50 miles away from the coast. The injury, according to Quayle, is due to the retention of the oil on the foliage and fruit, and is therefore more marked in the cooler and more moist sections along the coast and during the winter period. According to some authors, however, the trees affected by drought are more subject to injury. It is evident that a careful study of the factors influencing injury by oil sprays, including the effect of summer oils sprays on foliage and fruit, is very much needed. Apparently the use of 1-2 per cent. emulsion on deciduous fruits, excepting peach, under normal favourable conditions, causes little or no injury to the foliage, fruit or tree, but fruit sprayed near harvest time may have a dull, unattractive appearance, in addition to which the dust adhering to the sprayed fruit is very difficult to remove.

In some cases it is reported that an oil spray combined with or following lead arsenate causes excessive adherence of residues of the latter. There is also some indication that lead arsenate in combination with oil emulsion causes dropping of fruit and foliage. Though oil sprays are very useful in more or less specific cases, the available information does not warrant their general recommendation as summer sprays.

It appears to be generally agreed that viscosity, volatility and specific gravity are a partial but not a complete index to the selection of suitable oils for different insecticide purposes.

White oils are apparently safer than ordinary lubricating oils, but more expensive; emulsions prepared with either red or white oils appear to be equally stable.

In most cases severe scorching occurs when oil follows a sulphur spray.

There is a great variety of opinion with regard to the relative merits of different emulsifiers. The soap emulsifiers with heat apparently give a more stable emulsion, but soap emulsions are more affected by waters upon dilution than are the cold-mixed emulsions with Bordeaux, casein, etc. An excess of emulsifier in the cold-mixed emulsions may reduce the efficiency of the spray, as does the addition of Bordeaux mixture as a fungicide.

S[WEZEY] (O. H.). *Archytas cirphis*—**An Explanation and Correction.**  
—*Jl. Econ. Ent.*, xx, no. 1, p. 236. Geneva, N.Y., February 1927.

In a previous paper [*R.A.E.*, A, xiv, 649] the name *Archytas cirphis*, Curran, was used and was incorrectly spelt [*cf.* also *R.A.E.*, A, xiv, 541]; it is pointed out that this is an undescribed species, but that Curran's description will be published shortly.

THOMAS (W. A.). U.S. Bur. Ent. **Injury to Sweet Potato by *Systema taeniata* var. *blanda* Larva.**—*Jl. Econ. Ent.*, xx, no. 1, pp. 236–237. Geneva, N.Y., February 1927.

The larvae of the flea-beetle, *Systema taeniata* var. *blanda*, Melsh., cause injury to sweet potatoes in North and South Carolina by making small pin-like holes in the epidermis. Injury is most common near the stem end of the tuber, though in some instances it may extend to the whole. In 1926 most of the damage was done during September and early October. The first adults emerged about the second week in October.

HOFFMAN (W. A.). **Damage to Potato by *Pycnoscelus surinamensis*.**—*Jl. Econ. Ent.*, xx, no. 1, p. 237. Geneva, N.Y., February 1927.

The cockroach, *Pycnoscelus surinamensis*, L., previously known chiefly to attack roses, is now recorded from southern Haiti as causing severe damage to potatoes. About 40 per cent. of the individuals collected were parasitised by *Sarcophaga sternodontis*, Towns.

MCATEE (W. L.). **Names of Apple Leaf Hoppers.**—*Jl. Econ. Ent.*, xx, no. 1, pp. 237–238, 1 ref. Geneva, N.Y., February 1927.

*Typhlocyba (Empoa) malini*, DeLong [*R.A.E.*, A, xiv, 449] is a synonym of *T. xanthippe*, McAtee [*R.A.E.*, A, xiv, 473], the latter name having a priority of 5 days.

Other leafhoppers breeding on apple in the United States are *T. pomaria*, McAtee, also occurring in Nova Scotia; *T. rosae*, L., which primarily feeds on rose; and *Erythroneura harti*, Gill. Other species of the last-named genus are only found temporarily on apple.

The status of *Eupteryx* and *Typhlocyba* is discussed [*cf. R.A.E.*, A, xv, 153].

**Injurious Insects and other Pests.**—*Rept. Kansas Agric. Expt. Sta.*, 1924–26, pp. 71–84. Manhattan, Kans., 1927.

An effort has been made during 1924–26 to accumulate data on the correlation of insect abundance and weather conditions during the last 20 or 30 years. It has been noticed that all the severe outbreaks of the chinch bug [*Blissus leucopterus*, Say] since 1871 have occurred during hot, dry years. When May and June were wet there were few reports of damage due to it; apparently the insect does not reproduce rapidly under wet, cool conditions, but a more important factor is the chinch bug fungus [*Sporotrichum globuliferum*], which thrives best under warm, moist conditions. The Hessian fly [*Mayetiola destructor*, Say] apparently thrives in years of high rainfall during July and August. *Illinoia pisi*, Kalt. (pea aphid) is evidently controlled largely by climatic factors. Experiments on peas and on lucerne showed that the average length of the reproductive period was 5.4 days with a total of 19.7 young on the former, and 10.8 days with 41 young on the latter, the average length of life being 14.5 days on peas and 21.3 days on lucerne. Moreover, the Aphids live longer and produce more young under constant temperatures than under uncontrolled field conditions, and lower temperatures are more favourable than higher ones, the largest number of young being produced at an average of 65°F. As the average temperature increases, the number of young produced decreases. These findings are borne out by observations in the field.

*M. destructor* is gradually spreading westward through Kansas. In 1925 there was a heavy emergence in September over most of the State. This generation developed slowly, many of the half-grown larvae overwintering, and emergence in the following spring was very irregular and prolonged. A marked difference in susceptibility of the varieties of wheat grown was noticed. The possibility of there being biological strains of *M. destructor* is being studied, owing to the fact that two varieties of wheat that are resistant to the fly in Kansas are susceptible in areas where these varieties have been grown for many years. Experiments have shown the importance of autumn rains in bringing about the emergence of the fly. Studies of the corn ear worm [*Heliothis obsoleta*, F.] have borne out the theory that maize planted about 1st May showed less injury than that planted either earlier or later. There is some indication that ears showing male florets are remarkably free from injury by this pest. The latest barrier remedies against *B. leucopterus* are described [R.A.E., A, xiv, 166]. Plants deficient in chlorophyll were apparently the first to die from injury by this insect. There was an unusual outbreak of the clover mite, *Bryobia praetiosa*, Koch (*pratensis*, Garm.) in 1924, the mites being very numerous on apple in late June, probably as the result of a long spell of hot, dry weather. Dusting with flowers of sulphur was an effective remedy, the mites disappearing in a few days.

Studies of the insects attacking *Sorghum* have shown that the chinch bug can hibernate in stubble of Sudan grass [*S. sudanense*], and as the acreage of this crop increases it will probably become an important factor in the incidence of the bug. *Aphis maidis*, Fitch, prefers *Sorghum* to maize and is found on it in early summer, leaving it for maize in mid-summer and returning later to *Sorghum* until frost kills the plants. Grain produced by the heads injured by *A. maidis* was less in quantity, shrivelled, and subject to fungus diseases. The germinating power was reduced, and the development of plants from injured seeds was retarded. A study of the hibernation habits of *Lachnosterna* (white grubs) and Elaterids (wireworms) show that the various species of grubs descend below the frost line when winter begins, the larvae being stratified according to species. Of the white grubs 75 per cent. were taken within the first foot of soil, and one species was taken at a depth of 40 in. Wireworms seldom go deeper than 6 in. Calcium cyanide and carbon bisulphide used as soil insecticides proved injurious to Kentucky bluegrass, lucerne and maize, while paradichlorobenzene caused no damage; the first two showed promise against white grubs but paradichlorobenzene was useless.

A practical method of controlling *Illinoia pisi* on lucerne that has given good results is the treatment of infested areas in fields in March and April by sowing calcium cyanide granules at the rate of about 30 lb. an acre. Where the areas are too large for this treatment, collection should be made with an aphidozer. Harrowing should be practised in infested areas where the lucerne is not too tall for cultivation. A few individuals of a rare Chrysopid, *Eremochrysa punctinervis*, McLach., were taken on lucerne; the larvae feed on Aphids, but are too scarce to be important. Opinions differ as to the hibernation of the green clover worm [*Plathypena scabra*, F.]; in Kansas it hibernates both as an adult or pupa, more often the latter. A possible means of controlling *Sitona hispidula*, F. (clover root curculio) on lawns was discovered by accident, practically all the beetles present on a small area having been found clinging to the underside of a rug that had been

left out through the night. Sodium arsenite bait scattered in the fields was very successful against grasshoppers; it severely injured sweet potatoes, but the effect on lucerne and maize was negligible. Amyl acetate appears to be the best attractant for the bait, and sodium arsenite the most satisfactory poison.

There have been heavy infestations of the woolly Aphids attacking elms, so that the vigour and value of the trees have been seriously impaired. The chief species are *Eriosoma lanigerum*, Hausm., *E. americanum*, Riley, and an unidentified species that attacks *Ulmus glabra* and *U. fulva*. *E. lanigerum*, instead of migrating to *Pyrus*, may remain on *Ulmus americana* throughout the summer in Kansas.

BISCHOFF (H.). **Biologie der Hymenopteren.**—vii+598 pp., 224 figs., 12 pp. refs. Berlin, Julius Springer, 1927. Price M. 28.20.

This volume is the fifth in the series of *Biologische Studienbücher* issued by Prof. Walther Schoenichen. In view of the vastness of the subject, completeness is not claimed for this natural history of the Hymenoptera, and subjects with an extensive literature, such as the habits of ants and of the honey-bee, are dealt with less fully than the results of recent research. In treating of the biology of the parasitic Hymenoptera the best known species are dealt with and also those of which the widely different life-histories assist in giving a complete picture of the habits of these parasites. There exist wide lacunae in the knowledge of the biology of the Hymenoptera, and it is hoped that this book may encourage work tending to fill in these gaps. The material is arranged according to subjects, such as morphology, movement, sense activities, nests, social life, development, parasitism, etc. There is an index to the genera mentioned and also a subject index.

HUDSON (C. E.). **The Control of Aphis on Black Currants.**—*Jl. Min. Agric.*, xxxiii, no. 12, pp. 1121-1127, 3 figs. London, March 1927.

An experiment to ascertain the degree of control obtainable over Aphids on black currants with various tar distillate and lime-sulphur sprays was carried out in East Anglia in 1926 on a three-acre field planted with two varieties of black currant. Strips of each variety were left untreated, while other strips were treated respectively with tar distillates (Spray B and Carbokrimp) at  $7\frac{1}{2}$  per cent. concentration early in February. With the exception of a part of each of these strips, the whole field was treated with lime-sulphur, 1:12, early in March, the leaves at the time of spraying being about the size of half-a-crown. Early in April the Aphid eggs began to hatch on the strips that had not been sprayed with tar distillate, remaining unchanged on the sprayed bushes. Lime-sulphur had no effect on the Aphids. By June all the control bushes were infested and had made little growth, while those treated with Carbokrimp were practically free from infestation and making vigorous growth; those treated with Spray B seemed little better than the controls. It was found, however, that treatment with Spray B increased the crop by nearly 100 per cent.; and with Carbokrimp by 140 per cent., the quality of the fruit being raised from third to first class. The cost of the sprays and labour involved worked out at 1d. a tree, or less than £6 an acre. At a price of 9d. a pound the value of the crop was £51 an acre in the case of one variety sprayed with Carbokrimp as compared with £21 for the crop of the unsprayed portion.

Bushes on which Aphids were controlled made good growth, and the benefits of successful spraying are likely to extend into subsequent years.

PICARD (F.). **Recherches sur la biologie de l'altise de la vigne** (*Haltica ampelophaga*, Guér.).—*Prog. agric. & vitic.*, lxxxvii, nos. 5, 7 & 11, pp. 114–117, 160–164 & 271–274. Paris, 30th January, 13th February & 13th March 1927.

This is a reprint of the greater part of a paper previously noticed [*R.A.E.*, A, xv, 58].

PAILLOT (A.). **Sur l'étiologie et l'épidémiologie de la gattine du ver à soie ou maladie des têtes claires.**—*C.R. Acad. Sci. France*, clxxxiii, no. 3, pp. 251–253. Paris, 1926.

An infectious disease of silkworms [*Bombyx mori*] is caused by *Streptococcus bombycis*. It is characterised by the swelling of the anterior end, which becomes more or less translucent, and the larva ceases to feed. Serious epidemics sometimes occur, especially when encouraged by lack of cleanliness, air and light. A drastic modification of the conditions, especially when the larvae are young, will lessen the ravages of the disease, and the use of disinfectants, such as sulphuric acid, formol, etc., is recommended to prevent it.

PAILLOT (A.). **Sur la gattine expérimentale du ver à soie.**—*C.R. Acad. Sci. France*, clxxxiv, no. 11, pp. 705–707, 2 refs. Paris, 1927.

The disease of silkworms caused by experimental inoculation of *Streptococcus bombycis* appears to be of a type differing sharply from the diseases previously observed in insects, both in its tissue and cell reactions and in its pathology. The process of infection and of resistance to it only represent different aspects of the same physiological phenomenon. Resistance is successful when the bacteria are definitely converted in the cells of the larva and lose their quality of parasites; but when the cell is incapable of retaining them there is a process of infection.

MALENOTTI (E.). **Il valore pratico dei follicoli nella diagnosi dei comuni Diaspiti.** [The practical Value of the Exuviae in the Identification of the common Italian Diaspinæ.]—*Italia Agric.*, lxiv, no. 2, pp. 52–55, 3 figs. Piacenza, 1927.

The differences in the exuviae of *Chrysomphalus* (*Aonidiella*) *robustus*, Grassi & Berl., *C. (A.) aurantii*, Mask., *C. dictyospermi*, Morg., and *Epidiaspis piricola*, Del Guerc., are described and figured.

BEZZI (M.). **Sulla distribuzione geografica della Mosca delle ciliege** (*Rhagoletis cerasi* L., Dipt.). [The Geographical Distribution of the Cherry Fly, *R. cerasi*.]—*Boll. Lab. Zool. gen. agrar. R. Scuola sup. Agric.*, xx, pp. 7–16, 65 refs. Portici, 1927.

This forms a supplement to the author's paper on *Rhagoletis cerasi*, L., published in the same journal in 1910. It deals exclusively with the geographical distribution of this fly, which is the only species of the genus found in Europe and which has not been recorded elsewhere.

CUSCIANNA (N.). **Note morfologiche e biologiche sulla *Simaethis nemorana* Hb.** [Morphological and Biological Notes on *Hemero-phila nemorana*.]—*Boll. Lab. Zool. gen. agrar. R. Scuola sup. Agric.*, xx, pp. 17-34, 11 figs. Portici, 1927.

The Tineid, *Hemero-phila* (*Simaethis*) *nemorana*, Hb., feeds on the leaves and inflorescences of figs, especially on the former, and is a serious pest in Italy, particularly in the coastal regions. It occurs throughout southern Europe, and in Asia Minor, North Africa, the Canary Islands, and Madeira. At Portici larvae appear about mid-May and begin to pupate early in June. Adults emerge in the second half of June and oviposit about two days later, laying about 50-60 eggs each on the upper surface of the leaves. The larvae hatch in 6-9 days. At the end of August and early in September eggs and newly-hatched larvae were seen, possibly belonging to a third generation. Pupae were observed in October. It is probable that hibernation occurs in the adult stage, an empty cocoon having been observed in October and an egg on 16th April. The larvae of the first generation skeletonise the leaves and may attack the leaflets of the young shoots. This means a loss of fruits, which are also directly injured by the larvae of the second generation. *H. nemorana* is never abundant in consecutive years, natural enemies keeping it in check. Predacious enemies include various spiders, ants and the earwig, *Forficula decipiens*, Gené. The parasites observed were the Chalcids, *Eurytoma rosae*, Nees, and *Stenomesus rufescens*, Rossi; the Proctotrupid, *Goniozus claripennis*, Först.; the Braconid, *Apanteles xanthostigma*, Reinh.; the Ichneumonid, *Pimpla alternans*, Grav.; and the Tachinid, *Lydella casta*, Rond. The remedial measures suggested are a spray containing 1 per cent. lead arsenate, applied immediately the first larvae are noticed, and the collection and destruction of the cocoons.

TRÄGÅRDH (I.). **Entomologiska analyser av torkande träd.** [Entomological Analysis of dying Trees.]—*Medd. Stat. Skogsförsöksanst.*, xxiii, no. 3, pp. 191-216, 12 figs., 7 refs. Stockholm, 1927. (With a Summary in English.)

A thorough analysis of the fauna of a dying tree shows whether the different bark-beetles and other insects attack in a definite succession and their distribution in different parts. To investigate the succession of the different species, it is sufficient to remove the bark of the whole tree and record the occurrence of the brood-galleries and their degree of development. This is best done at the beginning of summer.

In this way it has been found that the attacks of *Myelophilus* (*Blastophagus*) *piniperda* and *M. (B.) minor* in pines very often follow the year after an attack by *Pissodes piniphilus* and *P. pini*. This does not necessarily mean that *Pissodes* is a more primary pest, the condition of the tree at the breeding seasons of the different insects determining which species are likely to attack it. A tree that is already sufficiently weakened in spring for the early-breeding Scolytids is attacked by them; a tree weakened later in the summer succumbs to the later-breeding weevils. The latter do not, however, destroy the cambium so thoroughly as the Scolytids, so that a pine attacked by them may die so slowly as to offer harbourage to the Scolytids in the following spring. If the weevils cause intensive injury, *Hylastes* (*Hylurgops*) *palliatu*s appears in the following spring, sometimes accompanied by a slight attack of *M. piniperda*. Two examples of this method of analysis are

given, with others illustrating the more detailed method of Golovyanko [R.A.E., A, xiv, 208], which is a development of the author's method designed to show the distribution of the insects in different parts of the tree.

HUKKINEN (Y.). **Maatalouskoelaitoksen tuhoeläinosasto vv. 1924-1925.** [Report of the Department of Entomology for 1924-25.]—*Maatalouden koetoiminnan keskusvaliokunnan vuosikertomus 1925.* [Ann. Rept. Centr. Bd. Agric. Res. 1925], pp. 31-35. Helsingfors, 1926. [Recd. April 1927.]

During 1925 special attention was given to *Phaedon cochleariae*, L. (mustard beetle), which is the most serious pest of cultivated crucifers in southern Finland. *Charaas graminis*, L. (antler moth) was present over large areas, causing severe damage to meadows. In 1924 many imported bulbs were found to be badly infested with *Rhizoglyphus echinopus*, F. & R. (bulb mite). Other pests studied were *Hydrellia griseola*, Fall., *Chlorops taeniorus*, Mg. (*pumilionis*, Bjerk.), *Mayetiola destructor*, Say, *Haplothrips statices*, Hal. (*niger*, Osb.), *Ceuthorrhynchus quadridens*, Panz., *C. rapae*, Gyll., *C. pleurostigma*, Marsh., *Pachynematus pumilio*, Knw., *Psila rosae*, F., and *Phorbia brassicae*, Bch.

VAPPULA (N. A.). **Hallaperhonen** (*Cheimatobia brumata* L.). [The Winter Moth, *C. brumata*.]—*Valtion Maatalouskoetoiminnan Tiedonantoja* [Bull. Govt. Agric. Res.], no. 2, 13 pp., 5 figs. Helsingfors, 1926. [Recd. April 1927.]

An account is given of the life-history and control of *Cheimatobia brumata*, L. In some years this moth does considerable damage to the foliage of fruit and ornamental trees in the south of Finland.

VAPPULA (N. A.). **Niitty-yökön** (*Charaas graminis*) **toukka eli n.s. niittymato ja sen torjuminen.** [The Larva of the Antler Moth, *C. graminis*, or the so-called Meadow Worm and its Control.]—*Valtion Maatalouskoetoiminnan Tiedonantoja* [Bull. Govt. Agric. Res.], no. 3, 14 pp., 6 figs. Helsingfors, 1926. [Recd. April 1927.]

Larvae of *Charaas graminis* appeared in enormous numbers in 1925 and 1926 on grass-lands, especially in the south-eastern and central parts of Finland. The severe outbreak of 1925 was probably due to the particularly favourable weather conditions of the preceding winter. The caterpillars, most of which emerge at the end of August, pass the winter in the soil and early the next spring begin to feed on the roots of young grass. They first appear in rather limited areas, but early in July, owing to the lack of food, they spread rapidly and widely over large areas. They definitely prefer *Aira caespitosa*; but other kinds of grass, cereals and forage crops are eaten when this is not available. Pupation takes place from about 25th June to 15th July, and the adults emerge two or three weeks later. Where possible, meadows should be ploughed and a regular crop rotation introduced. The spread of the larvae may be limited by making deep, broad trenches round the affected spots before a mass movement begins. Spraying with arsenicals can only be carried out in the spring when the larvae are in relatively smaller areas. In some cases burning the infested dry meadows is effective.

LISTO (J.). **Kääpiöohrakärpänen** (*Chlorops pumilionis* Bjerk.). [The Straw-fly, *C. taeniopus*.]—*Valtion Maatalouskoetoiminnan Tiedonantoja* [Bull. Govt. Agric. Res.], no. 4, 8 pp., 8 figs. Helsingfors, 1926. [Recd. April 1927.]

*Chlorops taeniopus*, Mg. (*pumilionis*, Bjerk.) causes considerable damage in some years in Finland, and mainly attacks barley. There are two generations a year. The larvae of the first generation attack the young ears and the stems under them, so that the stalks remain short and become thickened and no ear is formed. The second generation injures recently sown winter crops, and hibernation takes place between the sheaths. Early ripening varieties of barley should be sown as early as possible. The winter crops should be planted later than usual, with the exception of trap-crops, which may be sown earlier to attract the flies for oviposition and should be ploughed under deeply some time afterwards.

LISTO (J.). **Kahukärpänen**, *Oscinella frit* L. [The Frit-fly, *O. frit*.]—*Valtion Maatalouskoetoiminnan Tiedonantoja* [Bull. Govt. Agric. Res.], no. 5, 7 pp., 3 figs. Helsingfors, 1926. [Recd. April 1927.]

*Oscinella frit*, L., is one of the most injurious insect pests of cereal crops, especially oats and barley, in Finland, where there are three generations a year. During the summer of 1925 it was very prevalent in Eastern Finland, and in some districts there was a loss of 25–50 per cent. of the crop of barley. Early sowing of summer crops, the use of measures that accelerate the growth of the young plants, such as drilling, proper cultivation and manuring, and late sowing of winter crops, reduce the injury. Trap-crops are suggested for attracting the flies in August.

ROSTRUP (S.). **Førsøg vedrørende Kløveraalems** (*Tylenchus devastatrix*) **Levedygtighed i renbrakket Jord og nogle andre Undersøgelser angaaende Kløveraalen**. [Investigation on the Vitality of the Clover Eelworm, *T. dipsaci*, in Fallow Land and other Researches on Clover Eelworms.]—*Tidsskr. Planteavl.*, xxxii, pp. 762–774, 2 figs. Copenhagen, 1926. (With a Summary in English.) [Recd. March 1927.]

The following is taken from the author's summary: The experiments described lasted 10 years and were begun in 1915 when earth infested with *Tylenchus dipsaci* (*devastatrix*) was placed in 18 cement pipes, arranged in two rows and buried vertically in the surface of the soil. In the same year red clover was sown in all the pipes, and in the course of a couple of months it proved to be heavily attacked. In the following year clover was sown only in one pipe in each row, and in one more pipe in each succeeding year. The soil in the remaining pipes was kept free from plants. When clover had not been grown for up to 4 years, the attack appeared in the summer of the seeding year. After 5 years without clover, the attack was not distinct until the middle of August in the following year, and after 6–7 years there was no attack in the year of ley or in the following two years, but, on repeated sowing, it appeared in the third year. In practice this means that attack might be expected in the year of ley when a two-years clover field is employed in a seven-years crop-rotation, and in an eight-years rotation it will

appear at any rate in the summer of the first harvest year. In a nine-years rotation with six clover-free years the attack can be avoided in the first harvest year, but it will probably appear in the second. A rotation of a long period does not free the soil of Nematodes, but in comparison with short-term rotations it essentially checks the attacks. There is a great improvement when a one-year ley (seeding year and one harvest year) is employed. Theoretically, this should prevent attacks in an eight-years rotation. The most reliable way of eliminating Nematodes from heavily infested soil is to omit the clover once from the rotation and substitute bird's-foot trefoil (*Lotus corniculatus*). It was found that hay kept as long as four winters still harbours this Nematode. Other observations showed that eggs are laid throughout the year and that it is the rather large larvae (0.5-0.9 mm.) that seek fresh plants.

GRAM (E.) & THOMSEN (M.). **Oversigt over Sygdomme hos Landbrugets og Havebrugets Kulturplanter i 1925.** [Review of Diseases and Pests of Agricultural and Horticultural Plants in Denmark in 1925.]—*Tidsskr. Planteavl.*, xxxiii, pp. 83-148, 7 figs. Copenhagen, 1927. (With a Summary in English.)

Pests not dealt with in the previous year's report [*R.A.E.*, A, xiii, 536] included *Agriotes* spp. and *Tipula paludosa* attacking cereals; *Calocoris norvegicus* (*bipunctatus*) on beet; *Pieris rapae* on crucifers; *Laphygma* (*Caradrina*) *quadripunctata*, which bored in potato stems in one locality; *Pteronius* (*Nematus*) *ribesii* injuring gooseberry and red-currant bushes; *Aphelenchus ormerodii* in strawberry plants; and *Acrolepia assectella* and *Hylemyia antiqua* attacking leeks. In green-houses *Trialeurodes vaporariorum* (the male-producing race) has spread considerably.

SCHEEPELTZ (O.). **Ein Staphylinide als Blütenschädling.** [A Staphylinid injurious to Blossoms.]—*Kol. Rundsch.*, xiii, no. 1, pp. 1-9, 1 fig. Vienna, 28th February 1927.

The Staphylinid beetle, *Anthobium ophthalmicum*, Payk., is recorded as feeding on the blossoms of *Rhododendron hirsutum* in Carinthia.

SEUFFERHELD (—). **Folgerungen aus den Jahren 1925 und 1926 für die diesjährige Schädlingsbekämpfung im Weinbau.** [Conclusions drawn from the Years 1925 and 1926 for combating Pests in Viticulture in 1927.]

SCHULTE-OESTRICH (O.). **Ueber Schädlingsbekämpfung im Obstgarten.** [On combating Orchard Pests.]

MÜLLERS (—). **Solbar zur Bekämpfung der Stachelbeerblattwespe.** [Solbar for combating the Gooseberry Sawfly.]—*Nachr. Schädlingsbekämpfung*, ii, no. 1, pp. 29-33, 3 figs.; pp. 37-38; pp. 38-39, 1 fig. Leverkusen b. Köln, March 1927.

Various proprietary insecticides are recommended for use against the moths [*Clysia ambiguella*, Hb., and *Polychrosis botrana*, Schiff.] and fungi on vines; the winter moth [*Cheimatobia brumata*, L.] on apples; and the gooseberry sawfly, *Pteronius ribesii*, Scop. (*Nematus ventricosus*, L.).

SCHÖPPACH (—). **Drahtwurmgefahr.** [The Danger of Wireworms.]—*Die kranke Pflanze*, iv, no. 3, pp. 42–43. Dresden, March 1927.

The following measures are recommended against wireworms infesting oats. Sowing should be done in rows at not less than 4 inches apart, and plenty of seed should be used. Rolling, followed by harrowing, should be done as soon as possible. In manuring, the whole amount of nitrogen should not be given at once, nor the whole amount of potash. The quantity used should be calculated so that it may be possible to add afterwards 88 lb. of potash ammonium nitrate to the acre without detriment to the crop. As soon as the oats have appeared the potash ammonium nitrate is put on the rolled land, which is then harrowed.

BERWIG (—). **Die Forleule in Bayern. Historisch-statistische Betrachtung.** [The Pine Moth in Bavaria. A statistical and historical Study.]—*Forstw. Zentralbl.*, xlviii, pp. 165–181, 209–217, 259–267, 293–297, 318–328, 2 figs. 1926. (Abstract in *Neuheiten Gebiete Pflanzenschutzes*, 1927, no. 1, p. 21. Vienna, 1927.)

The first part of this paper is a complete record of the outbreaks of the pine-moth [*Panolis flammea*, Schiff.] in Bavaria. The second part includes a discussion of the various factors responsible for bringing about and ending such outbreaks.

ZIRNITS (J.). **6-7 jūnija nakts salnas iespaidu uz dažū lapu utu sugu attīstību.** [On the Influence of Night Frost, on 6th–7th June 1925, on the Development of certain Aphidae.] [*In Latvian*.]—*Rept. Inst. Plant Prot. 1925–26*, pp. 33–34. Latvian Agric. Soc., Riga, 1926.

On the night of 6th–7th June 1925, the temperature in northern Latvia fell to  $-2^{\circ}$  C. [ $28.4^{\circ}$  F.]. It was observed that the nymphs of the second generation of *Chermes abietis*, L., and *C. (Cnaphalodes) strobilobius*, Kalt., were killed by this frost, and the Aphids were rare in the following summer. The frost had the same effect on *Asiphum tremulae*, L., but the nymphs of the second generation of a number of other Aphids proved very resistant to such a fall of temperature, including the following: *Aphis rumicis*, L., *Symydobius oblongus*, Heyden, *Lachnus piceicola*, Cholodk., *Schizolachnus (Lachnus) tomentosus*, DeG., *Tetraneura ulmifoliae*, Baker (*ulmi*, DeG.), *Eriosoma (Schizoneura) ulmi*, L., *Anoecia corni*, F., and *Thecabius affinis*, Kalt.

HODSON (W. E. H.). **Some Insect Pests and their Control.**—*Trans. & Proc. Torquay Nat. Hist. Soc. 1925–6*, iv, no. 4, pp. 330–334. Torquay, 1926. [Recd. April 1927.]

Notes are given on a few of the insect pests that proved of considerable economic importance in South Devon in 1925, all of which have been recorded in a report already noticed [*R.A.E.*, A, xiv, 215].

CUTHBERTSON (A.). **Note on an Ichneumon (*Stenichneumon trilineatus*, Grav.), parasite of the Magpie-moth (*Abraxas grossulariata*, Steph.).**—*Scot. Nat.*, no. 163, p. 24. Edinburgh, January–February 1927.

*Stenichneumon trilineatus*, Grav., was found to have parasitised 25 per cent. of a large number of larvae of *Abraxas grossulariata*, Steph., infesting black currant and gooseberry bushes in the autumn of 1925 near Glasgow.

ROBERTSON (D.). **Notes on Soil Nematoda.**—*Proc. R. Phys. Soc.*, xxi, no. 2, pp. 83–88. Edinburgh, December 1926. [Recd. April 1927.]

Details are given of the dry and wet methods of determining the number of Nematodes in soil. While the former gives more accurate results, the latter method is quicker.

OEBENBERGER (J.). **Orthoptères et Dermaptères de la République Tchecoslovaque.**—*Bull. intern. Acad. Sci. Bohême*, pp. 1–126, 4 pls., 25 figs. Prague, 1926. [Recd. May 1927.]

This is a revision of the Orthoptera and Dermaptera of Czechoslovakia, with keys to the genera and species and notes on their distribution.

NÜSSLIN (O.) & RHUMBLER (L.). **Forstinsektenkunde.** [Forest Entomology.]—4th edn., 8vo, xvi+625 pp., 490 figs., numerous refs. Berlin, Paul Parey, 1927. Price M.24.

In this, the fourth edition of this work, over 550 additional items of information obtained since the last edition in 1922 [*R.A.E.*, A, x, 329] are included. There is an alphabetical list of the plants concerned, the insects attacking them being enumerated in each case with page references.

HENDEL (F.). **Beiträge zur Oekologie der Agromyziden (Dipt.).** [Contribution to the Ecology of the Agromyzidae.]—*Zeitschr. Morph. u. Oekol. Tiere*, vii, no. 3, pp. 480–488, 3 figs. Berlin, 17th March 1927.

The mines of leaf-mining Agromyzids and their configuration are described.

KORHAMMER (K.). **Die Anfälligkeit einiger Hafersorten gegen die Fritfliege unter verschiedenen Wachstumsbedingungen.** [The Susceptibility of some Varieties of Oats to Attack by the Frit-fly under various conditions of Growth.]—*Nachrichtenbl. deutschen Pflanzenschutzdienst*, vii, no. 4, pp. 33–35, 6 refs. Berlin, April 1927.

In experiments in Bavaria in 1924, four varieties of oats were tested for susceptibility to attack by the spring generation of the frit-fly [*Oscinella frit*] under the varying conditions of different dates of sowing and different distances between the seeds. It was found that the resistance of a given variety varies with the stage of its development at

the date when the attack starts, the danger being greatest at the beginning of development. Rapid development in the early stages and a moderate, early and rapid tillering render a variety more resistant. A large capacity for tillering is not an unmixed advantage as the production of the shoots exhausts the plant, which is then unable to produce seed.

PUSTET (—) & SELL (—). **Verspricht die Bekämpfung der Maikäfer mit gifthaltigen Verstäubungsmitteln vom Flugzeug aus Erfolg?** [Does the Dusting of Insecticides from Aeroplanes promise Success against Cockchafers?]  
—*Prakt. Bl. Pflanzenbau*, 1926, pp. 25–30.  
(Abstract in *Centralbl. Bakt. Paras. Infekt.*, 2te Abt., lxx, no. 1–7, p. 165. Jena, 6th April 1927.)

Dusting forest trees from an aeroplane is unsuitable against cockchafers [*Melolontha*] because the latter emerge over a period of 4–6 weeks at a season (April–June) when rain is frequent, thus rendering repeated applications necessary; these are also needed to protect the new leaves that are continually appearing.

SILVESTRI (F.). **Studi sugli Aphelininae (Hymenoptera : Chalcididae). I. Un nuovo genere e una nuova specie di Aphelininae del Giappone.** [Studies on the Aphelininae. I. A new Genus and new Species from Japan.]—*Boll. Lab. Zool. gen. agrar. R. Scuola sup. Agric.*, xx, pp. 35–41, 4 figs. Portici, 16th March 1927.

*Diaspiniphagus*, gen. n., of which *Prospaltella similis*, Masi (*ilicis*, Mercet) is the type, includes *D. kuwanai*, sp. n., taken from peach twigs from Japan infested by *Aulacaspis* (*Diaspis*) *pentagona*, Targ.

COLIZZA (C.). **Il verme dei garofani (*Tortrix pronubana* Hb.).** [The Carnation Caterpillar.]—*Boll. Lab. Zool. gen. agrar. R. Scuola sup. Agric.*, xx, pp. 42–59, 9 figs., 8 refs. Portici, 26th March 1927.

In the Italian Riviera carnations are severely attacked by the larvae of *Dianthoecia compta*, F., which remain hidden in the ground by day and feed by night on the flowers. Those of another Noctuid, *Calocampa exoleta*, L., remain among the leaves on which they feed, but it is rare for them to be seriously injurious.

The larva of *Tortrix pronubana*, Hb., which lives in the shoots and feeds on the parenchyma of the leaves and of the tips of tender shoots, may be a more serious pest. A description of the various stages is given. At Portici, the adults begin to appear early in February and are numerous in July and August. There are four generations a year, the first pupating in the middle of February, the second at the end of April, the third at the beginning of July, and the fourth at the end of August. The eggs, of which 79–300 may be laid by a female, are nearly always deposited on the upper surfaces of the leaves, or on the twigs. Incubation takes 15–19 days, while the pupal stage occupies 10–15 days of the period of 35–40 days from the hatching of the larvae to the emergence of the moths.

The parasites obtained were the Tachinids, *Nemorilla floralis*, Fall., which oviposits on the mature caterpillar in the cocoon of which it

pupates, and *Actia pilipennis*, Fall., which also oviposits on the mature caterpillar, but the larva of which emerges and pupates among the leaves; the Chalcids, *Chalcis intermedia*, Nees, which is an endophagous parasite of the pupae, and *Elachistus affinis*, Masi, which attacks the larvae and has numerous generations a year; and the Ichneumonid, *Pimpla alternans*, Grav., and the Braconid, *Apanteles lacteus*, Nees, which are endophagous parasites of the pupae and larvae respectively. Biological control may be assisted by storing the plants (after the flowers have been picked) in rooms closed with wire netting, thus allowing the parasites to escape.

The collection of the caterpillars requires to be done at frequent intervals and is therefore costly. A nicotine or lead arsenate spray, applied about the time that the larvae hatch, is an excellent remedy.

ZIRPOLO (G.). **Per la lotta contro la cocciniglia degli agrumi.** [The Control of the *Citrus Scale*.]—*Boll. Soc. Nat. Napoli*, xxxvii (1925), Com. verb., pp. 6-7. Naples, 10th February 1926. [Recd. March 1927.]

Spraying *Citrus* plants infested with *Chrysomphalus dictyospermi*, Morg., with such liquids as xylol, carbon bisulphide, etc., dissolves the waxy secretion and kills both adults and larvae. Although this has not yet been carried out on a large scale, the cost should not be excessive, since only one spraying is necessary, and this may be done in winter when labour is cheap.

DE STEFANI (T.). **Piccole note su alcuni insetti.** [Short Notes on certain Insects.]—*Nat. siciliano*, xxv, no. 1-12, pp. 1-10. Palermo, 1926. [Recd. April 1927.]

Short notes are given on 40 insects of varied economic importance in Sicily. They include *Philaenus lineatus*, L., which attacks hazel [*Corylus*]; *Rhizococcus falcifer*, Künk., which is found from the beginning of March on the roots of vines and such plants as *Convolvulus arvensis*; *Lasioderma redtenbacheri*, Bach, very destructive to chestnuts, which it attacks immediately after they have been gathered; the Noctuid, *Grammodes geometrica*, Rossi, which attacks the leaves of *Ricinus*, the adults appearing towards the middle of September; and the Arctiid, *Ocnogyna baetica*, Rbr., the larvae of which live on beans, grasses, etc., and pupate on the ground in cocoons at the end of April.

CHEVALIER (J.) & RIPERT (—). **Action pharmacodynamique et titrage physiologique des préparations de fleurs de pyréthre.**—*C.R. Acad. Sci. France*, clxxxiv, no. 12, pp. 776-778, 1 ref. Paris, 1927.

Owing to the fact that it is harmless to vertebrates pyrethrum is becoming increasingly important as an insecticide, not only against plant pests, but also against parasites of man and animals.

The amount of pyrethrins in 10 cg. of a good pyrethrum powder in 80 g. water in contact with larvae of *Clysia ambiguella* kills them in a few minutes. Pyrethrum has a toxic action on the muscles and on the nerve centres.

LAING (F.). **Synonymical Note on *Rhizobius graminis* Buckt. reported from Egypt (Aphididae).**—*Entomologist*, lx, pp. 115–116. London, May 1927.

Some winged Aphids recorded from Egypt in a recent bulletin [*R.A.E.*, A, xv, 18] as *Rhizobius graminis*, Buckt., are considered by the author to be *Aploneura lentisci*, Pass. If this identification is right, there must be a migration between *Pistacia*, or some other food-plant, on which the species is a gall-maker, and the roots of grasses.

MALLOCH (J. R.). **A New Agromyzid Fly of Economic Importance from Africa.**—*Ann. & Mag. Nat. Hist.*, xix, no. 113, pp. 575–577. London, May 1927.

The names of the subgenera of *Leucopis* [*R.A.E.*, A, x, 206] are revised, and a key to them is given. *L. (Leucopella) africana*, sp. n., is described from Kenya Colony, where it is predacious on *Pseudococcus citri*, Risso, on coffee.

MALLOCH (J. R.). **Some Indian Chloropidae (Diptera) of Economic Importance.**—*Ann. & Mag. Nat. Hist.*, xix, no. 113, pp. 577–581. London, May 1927.

The new species described from India are *Lagarocerus tenuicornis* reared from larvae boring in shoots of *Chloris barbata*; and *Chalcidomyia atricornis* and *Formosina flavipes* reared from larvae boring in ginger plants. It is uncertain, however, whether these larvae actually caused the mines from which they were reared, and they may possibly be only secondary pests.

SONAN (J.). **Scientific Names of and Observations on some Formosan Hymenoptera.** [*In Japanese.*]—*Trans. Nat. Hist. Soc. Formosa*, xvii, no. 89, pp. 121–138. Taihoku, Formosa, April 1927.

*Polistes formosanus*, sp. n., is common in Formosa, and captures Lepidopterous larvae. *Vespa formosana*, sp. n., sometimes attacks the honey bee and is of economic importance to bee-keepers in the Island.

TAKAHASHI (R.). **Three Psyllids and a Fulgorid.** [*In Japanese.*]—*Trans. Nat. Hist. Soc. Formosa*, xvii, no. 89, pp. 152–156. Taihoku, Formosa, April 1927.

The Psyllids discussed include *Leptynoptera sulfurea*, Crawf., var. *rubrocincta*, Uichanco, which is new to Formosa and is abundant on leaves of *Calophyllum inophyllum*. The Fulgorid, *Purohita cervina*, Dist., is common on young leaves and stalks of *Dendrocalamus*, sometimes in dense groups. All stages occur in abundance throughout the year. Notes are given on the metamorphosis with a key to the five nymphal stages.

MONZEN (K.). **New Species of Aphididae producing Galls in Morioka.** [*In Japanese.*]—*Morioka Agr. & Forest Coll. Alumni Soc. Bull.*, iv, pp. 1–24. Morioka, Japan, February 1927.

The following Aphids are described from Morioka, Japan: *Myzus higansakuræ*, sp. n., the eggs of which hatch on *Prunus subhirtella* at

the end of April or the beginning of May, the winged forms of the second generation leaving this food-plant for a summer one, which seems to be *Artemisia*, and the autumn migrants returning at the end of October; *M. rarus*, sp. n., on *P. serrulata* var. *spontanea* causing the leaves to curl; *M. fukis*, sp. n., on *Petasites japonicus*; *Pemphigus matsumurai*, sp. n., on *Populus maximowiczii*, the winged forms leaving the galls for an unknown food-plant until the beginning of July; *Prociphilus kuwanai*, sp. n., on pear trees, the stem-mothers hatching in the middle of May and each producing about 100 young, which acquire wings in the middle of June and migrate to an unknown intermediate food-plant; *P. sasakii*, sp. n., on apples, the summer food-plant being unknown; *P. pourthiacae*, sp. n., on *Pourthiaca villosa*, the spring migrants leaving the food-plant until the middle of June; *Glyphina pterocaryae*, sp. n., on *Pterocarya rhoifolia*; *Hamamelistes shirakabae*, sp. n., on *Betula japonica*; and *Oregma sasae*, sp. n., on *Sasa ramosa*.

KATSUYAMA (Y.). **On the Control of *Delphax furcifer*, Horv., infesting the Rice Plant.** [In Japanese.]—*Insect World*, xxxi, no. 3, pp. 93-96. Gifu, March 1927.

The application of tobacco dust, pure or mixed with lime or ashes, is recommended for the control of *Delphax furcifer*, Horv., on rice.

TAKANO (S.). **On the Scientific Names and Distribution of Diptera parasitic in Silkworms in Japan.** [In Japanese.]—*Insect World*, xxxi, no. 3, pp. 98-100. Gifu, March 1927.

*Sturmia* (*Crossocosmia*) *sericariae*, Rond., and *Tricholyga bombycum*, Bech., are recorded as parasitic on silkworms [*Bombyx mori*, L.].

TANAKA (K.). **Insects and Fungi detected on Imported Plants at the Nagoya Plant Quarantine Station during 1926.** [In Japanese.]—*Insect World*, xxxi, no. 3, pp. 102-104. Gifu, March 1927.

Various stages of *Araecerus* (*Araecerus*) were found in roots of cassava [*Manihot utilissima*] imported from Papua, and numerous adults of *Dinoderus pilifrons*, Lesne, in bamboos from Rangoon.

KUWANA (I.) & ISHII (T.). **An Account of introducing *Scutellista cyanea*, Motsch., to check *Ceroplastes rubens*, Mask.** [In Japanese.]—*Kontyu*, ii, no. 1, pp. 17-24, 8 figs. Tokyo, March 1927.

The Pteromalid, *Scutellista cyanea*, Motsch., was introduced into Japan from California in 1924, with *Saissetia oleae*, Bern., as the host, and oviposited on *Lecanium* (*Eulecanium*) sp., *Ceroplastes rubens*, Mask., and *C. floridensis*, Comst. Attempts to establish it on *Ceroplastes* infesting *Citrus* in the field proved unsuccessful, because these Coccids only oviposit once a year, while the parasite, the larvae of which feed on the eggs of the host, has three or four generations annually. The adults live for more than a month when fed on sugar or honey solution, but only two or three days without food. They insert their eggs under the bodies of adult Coccids. The parasites reach the adult stage in 35 days when bred on *Ceroplastes rubens* and in 51 days on *Lecanium*. Descriptions are given of the various stages.

HORI (H.). **On the Larvae and Pupae of six Species of Moths.** [In Japanese.]—*Kontyu*, ii, no. 1, pp. 35-41, 3 pls. Tokyo, March 1927.

Among the moths dealt with the larvae of the Lymantriid, *Euproctis pulverea*, Leech, feed on the leaves and flowers of peach, *Prunus japonica*, *Eurva japonica*, *Myrica rubra*, *Rosa* spp., and *Amelanchier asiatica* in April and pupate at the beginning of May, the moths emerging at the end of the month. Adults of a second generation appear in July.

The Geometrid, *Peratophyga acrata*, Moore, has two or three generations a year, hibernating in the pupal stage. The moths appear from the middle of April to July and again in September. The larvae feed on *Hypericum patulum*.

Another Geometrid, *Zamacra juglansiaria*, Graeser, has one generation a year, hibernating in the pupal stage. The moths appear from the middle of March to the beginning of April, and the larvae hatch in the middle of the month and attack the leaves of mulberry (*Morus alba*), *Pyrus serotina* and *Juglans* spp., becoming mature at the end of May.

The larvae and pupae of all the species dealt with are described.

SATO (S.). **On the Insect Enemies of *Popillia japonica*.** [In Japanese.]—*Kontyu*, ii, no. 1, pp. 44-47. Tokyo, March 1927.

There are 13 insect enemies of *Popillia japonica*, Newm., in Japan, some of which have been introduced into the United States. Notes are given on some that are considered to be among the more important ones, viz., *Centeter cinerea*, Ald., *Ochromeigenia ormioides*, Town., *Prosenia siberita* F., and *Tiphia* spp.

AOKI (U.). **On *Polyommatus baeticus*, L., infesting *Vicia faba*.** [In Japanese.]—*Kontyu*, ii, no. 1, pp. 53-55. Tokyo, March 1927.

The larvae of *Lampides (Polyommatus) baeticus*, L., occurred in large numbers on beans (*Vicia faba*) in December 1924 in the Chiba prefecture, causing serious damage. They fed chiefly on the pods and flowers, but also on the stalks, and the adults appeared in the following month. The pupae were found among the fallen leaves and dry weeds.

MURATA (J.). **On *Smerinthus ocellatus*, L., the Pest of the Willow.** [In Japanese.]—*Jl. Plant Prot.*, xiv, no. 4, pp. 225-230. Tokyo, April 1927.

*Smerinthus ocellatus*, L., has two generations a year; the winter is passed in the pupal stage, and the adults appear at the beginning of June and again in August. The larvae feed on the leaves of willow and are also known to attack apple and cherry trees; they are parasitised by a Chalcid. The pupal stage lasts two weeks in summer. The remedial measures recommended are collecting the larvae, flooding the infested field during the pupal stage, and spraying with a solution of pyrethrum and soap.

BOYCE (J. S.). **Observations on Forest Pathology in Great Britain and Denmark.**—*Phytopathology*, xvii, no. 1, pp. 1-18, 29 refs. Lancaster, Pa., January 1927.

The most serious injury to *Pseudotsuga taxifolia* (*douglasi*) observed by the author in 1925 during a visit to Britain to investigate the diseases of forest trees was caused by *Chermes cooleyi*, Gill., originally introduced from North America. While this Aphid rarely, if ever, kills the trees, they become stunted and weak. In North America, where it also attacks Sitka spruce [*Picea sitchensis*], it is practically innocuous, and the introduction of its parasites into Britain might be of value. *Chermes* (*Dreyfusia*) *nüsslini*, Börner, which attacks silver fir [*Abies*] was apparently introduced into Britain from the Continent, where it is widely distributed, but not very injurious. In 1925 it was widespread in Britain, the damage being so severe that the further planting of silver fir may have to be discontinued.

HARTLEY (C.). **Notes on Hibiscus Diseases in West Java.**—*Phytopathology*, xvii, no. 1, pp. 25-27, 5 refs. Lancaster, Pa., January 1927.

Root knots abundant on *Hibiscus cannabinus* in West Java were found to be due to *Heterodera radiculicola*, Greeff.

JONES (F. R.) & GRANOVSKY (A. A.). **Yellowing of Alfalfa caused by Leafhoppers** (Abstract).—*Phytopathology*, xvii, no. 1, p. 39. Lancaster, Pa., January 1927.

In experiments to determine whether *Empoasca fabae*, Harr., is responsible for alfalfa yellows, healthy lucerne plants in cages were infested with leafhoppers from infected lucerne in the field. Yellowing and dwarfing, indistinguishable from that in the field, resulted, while the uninfested lucerne in control cages was vigorous and green. In autumn the lucerne crowns in the infested cages were conspicuously smaller than those in the control ones, and many small seedlings of one variety were dead.

McKAY (M. B.) & DYKSTRA (T. P.). **Sugarbeet Curly-top Virus, the Cause of Western Yellow Tomato Blight** (Abstract).—*Phytopathology*, xvii, no. 1, p. 39. Lancaster, Pa., January 1927.

Evidence indicates that western yellow tomato blight is caused by the virus of sugar-beet curly-top. Leafhoppers, *Eutettix tenella*, Baker, from infected beets were placed on healthy tomato plants in a greenhouse. After an incubation period of 2-3 weeks, general yellowing of the foliage was observed, with a rolling of the leaves, a purpling of the veins and a marked stunting of the plants. Some of the same leafhoppers that transmitted the disease to tomatoes also caused curly-top in beets. The controls all remained healthy.

McKAY (M. B.) & DYKSTRA (T. P.). **Curly-top of Squash** (Abstract).—*Phytopathology*, xvii, no. 1, p. 48. Lancaster, Pa., January 1927.

Observations suggested that the curly-top, which caused a general failure of the crops of squash in Oregon, Washington and Idaho in 1926,

was due to the virus of sugar-beet curly-top. The disease was readily produced in the greenhouse on healthy plants, by the use of *Eutettix tenella*, Baker, infected with curly-top of sugar-beet. Leafhoppers that induced curly-top on squash also caused the disease on sugar-beet. The controls invariably remained healthy.

RANKIN (W. H.). **Mosaic of Red and Black cultivated Raspberries** (Abstract).—*Phytopathology*, xvii, no. 1, p. 46. Lancaster, Pa., January 1927.

The degree of control obtained by the use of mosaic-free planting stock and roguing of red and black raspberries is extremely variable in New York. The causes of this variation apparently include such factors as the relative abundance of the principal insect vector, *Amphorophora rubi*, Kalt., variations in the frequency and intensity of Aphid dispersal and the susceptibility to attack of the variety in question. Mosaic is believed to spread almost entirely by the mechanical dispersal of the vector by wind, rain and cultivation operations. A biological relation between the Aphid and the virus is indicated by the fact that infection in raspberries is initiated only by Aphids in the first and second instar. Mosaic in red and black raspberries has been proved identical and is the most important virus disease of both species in New York.

KUNKEL (L. O.). **The Corn Mosaic of Hawaii Distinct from Sugar Cane Mosaic** (Abstract).—*Phytopathology*, xvii, no. 1, p. 41. Lancaster, Pa., January 1927.

Experiments with *Peregrinus maidis*, Ashm., obtained from North Carolina show that it is unable to transmit the virus of the sugar-cane mosaic of the United States to maize, in spite of the fact that it transmits mosaic disease of maize in Hawaii. This suggests that the destructive mosaic of maize prevalent in Hawaii is distinct from sugar-cane mosaic and from the mosaic of maize occurring in Louisiana and other Southern States.

SCHERER (C. M.). **Tree Injection for Control of Fungous Diseases and Insect Pests** (Abstract).—*Phytopathology*, xvii, no. 1, p. 51. Lancaster, Pa., January 1927.

During the summer of 1926 birches, elms and other trees were injected with various chemicals for the purpose of controlling *Agrilus anxius* (bronze birch borer), *Gossyparia spuria* (European elm scale) and various diseases. As regards the insects the results were all negative.

HALLOWELL (E. A.), MONTEITH (J.) jnr., & FLINT (W. P.). **Leafhopper Injury to Clover** (Abstract).—*Phytopathology*, xvii, no. 1, p. 58. Lancaster, Pa., January 1927.

For several years an injury resembling hopper-burn of potatoes has been observed on clovers and other leguminous plants. It was especially widespread during the summer of 1926 and was associated with an unusual abundance of leafhoppers. Experiments in Illinois, in which red clover was grown in adjacent insect-proof cages, one

heavily infested with *Empoasca fabae*, Harr. (*mali*, LeB.), the other free from insects, apparently demonstrated that leafhoppers were responsible for the condition observed and that the relatively glabrous English clover suffered more than the pubescent Tennessee strain. Affected leaves, sometimes simply yellowed or bronzed, are often slightly curled and usually show tip and marginal browning, while frequently the entire leaf turns brown. The plants remain dwarfed, and many die. Bordeaux mixture appeared to repel the leafhoppers, as it does on potatoes. On red clover in Virginia, where numerous species of leafhoppers were abundant, the damage was most noticeable on Italian clover, the native hairy strains showing much less injury. Lucerne in Italian clover plots, as well as in extensive plantings near, was also severely dwarfed and had the typical yellow-top appearance.

HANSEN (H. H.). **Control of Internal Rot of Caprifig Figs.**—*Phytopathology*, xvii, no. 3, pp. 199–200, 2 refs. Lancaster, Pa., March 1927.

Since a new disease of caprifig figs was observed in California [*R.A.E.*, A, xiv, 61], it has spread rapidly and entailed considerable loss. This disease is caused by *Fusarium moniliforme* var. *fici*, and is transmitted only by the caprifying Chalcid, *Blastophaga psenes*, L., the fungus spores being carried externally by the insect. The author treated a large number of caprifigs internally with 0.05 per cent. mercury bichloride; 0.2 per cent. formaldehyde; 0.1 per cent. mercurochrome; 0.2 per cent. semesan; and 5 per cent. commercial lime-sulphur solution. Injections were made with a hypodermic syringe through the eye of the fig, not less than three weeks after the fig had been caprifigged, so that the insects would be in the larval or pupal stage, and therefore well down in the centre of the gall. This treatment had apparently no adverse effect on either the figs or the insects. All the treated figs, and the insects from them, were found to be free from the fungus, whereas the untreated figs, and the insects from them, were all infected. This appears to indicate that control may be effected economically by internal treatment of a limited number of caprifigs (preferably Mammone) with any of these fungicides. By removal and destruction of all untreated figs, the source of infection would be eliminated and a clean strain of *B. psenes* established.

KUNKEL (L. O.). **Studies on Aster Yellows.**—*Amer. Jl. Bot.*, xiii, no. 10, pp. 646–705, 5 pls., 4 figs., 33 refs. Lancaster, Pa., December 1926.

Aster yellows is prevalent throughout the United States. It can be transmitted by budding, though not by other mechanical means, but is readily transmitted by *Cicadula sexnotata*, Fall. This leafhopper can live on a large number of plants besides asters, including lettuce, cereals, and many weeds. During three years' continuous observations, it passed through at least 25 generations. The females of one generation have not finished ovipositing by the time that those of the next begin. In a greenhouse at 70–75° F. the life-cycle from egg to egg takes about 40 days, and the average life of an insect kept under favourable conditions at this temperature is about 120 days. The eggs are laid under the epidermis of the leaves and hatch, at about 70° F., in 11–13 days. The adult stage is reached between the 31st and 41st days.

When subjected to a temperature of 5° C. [41° F.], both adults and nymphs die in a few hours. They are evidently unable to live through the winter, which is apparently passed in the egg stage.

Infected and uninfected leafhoppers both produce wilting and discolouration of aster plants, but if they are promptly removed, the plants recover. Direct injury appears a few hours after plants are exposed and is proportional to the number of insects and to the time during which they feed. The disease only appears after a definite incubation period of 16-18 days, and its severity is in no way proportional to the number of insects used in transmitting it, or to the time during which they feed. Neither nymphs nor adults are able to transmit the virus immediately after feeding on plants affected with yellows; 10 days, at least, are necessary before they become infective. A somewhat longer time is required for nymphs than for adults. Many of the insects retain the virus as long as they live, but some appear to lose it after a short time.

Aster yellows is not transmitted through the eggs of the insect or through the seeds of the aster, or directly from an infected insect to an uninfected one. It has been transmitted experimentally by *C. sexnotata* to more than 50 species of plants in 23 families. In the same way it has been carried from many of these back to asters. The virus is not attenuated by passage through different plants. Although it is similar to peach yellows, strawberry yellows, curly top of beet, etc., these diseases are not transmitted by *C. sexnotata*, nor can it transmit aster yellows to these plants. The disease is, however, identical with white-heart disease of lettuce, an undescribed disease of buckwheat (*Fagopyrum esculentum*), and several yellows diseases of cultivated garden plants.

In experiments the disease was not transmitted by *Lygus pratensis*, L., *Empoasca flavescens*, F., *Agallia sanguinolenta*, Prov., *Graphocephala coccinea*, Frst., *Myzus persicae*, Sulz., *Thrips tabaci*, Lind., *Trialeurodes vaporariorum*, Westw., or *Tetranychus telarius*, L.

The best means of control of the disease are eradication of susceptible weeds, destruction of plants as soon as they show the disease, and spraying or dusting with nicotine, etc.

CAFFREY (D. J.) & WORTHLEY (L. H.). **A Progress Report on the Investigations of the European Corn Borer.**—*U.S. Dept. Agric.*, Dept. Bull. 1476, 154 pp. 53 figs., 72 refs. Washington, D.C., February 1927.

This paper records the results of investigations by the U.S. Bureau of Entomology on the bionomics of *Pyrausta nubilalis*, Hb., covering the period between the spring of 1918 and the autumn of 1924. The synonymy of the species and its distribution in America and elsewhere are discussed. Much of the information concerning it in Europe has been taken from an unpublished manuscript by J. Jablonowski, who stated that the damage done in Hungary, which varied from 5 to 60 per cent. of the maize crop in 1916, reached its culmination in 1919 and has since been diminishing, the loss in 1921 being considered unimportant.

A detailed description is given of the various stages of the moth and of its effect on the different types of plants. The recorded food-plants in various parts of the world are discussed; in the New England

area the borers have been found on 215 different species and varieties, and of these over 150 are tabulated according to the severity of infestation; they include various grain crops, vegetables, etc.

A detailed account is given of the life-history and habits, and of the seasonal history as occurring in the different States, with brief reference also to Canada and Europe. Observations on the effects of natural barriers have shown that the moths can fly for a considerable distance across water and are able to alight on the surface of the water and again take flight. This may be an important factor in the dispersion along the Atlantic coast and in the Lake Erie region. Natural enemies do not attack the pest to any appreciable extent in America; both the native ones and those introduced from Europe are discussed. In a supplement the situation regarding *P. nubilalis* in America and elsewhere up to the end of 1926 is reviewed.

ROHWER (S. A.). **Some Scoliid Wasps from Tropical America.**—*Jl. Wash. Acad. Sci.*, xvii, no. 6, pp. 150–155, 1 ref. Baltimore, Md., 19th March 1927.

Notes are given on a number of species of *Campsomeris* from Tropical America, including *C. completa*, sp. n., from Mexico, and *C. hesteræ*, sp. n., from Trinidad, Guatemala, Venezuela and Ecuador, which has been imported into Porto Rico, where it has oviposited on larvae of *Lachnosterna portoricensis*, Smyth. *C. pyrura*, Roh., is considered to be a synonym of *C. tricineta*, F.

*Elis caracasana*, sp. n., is described from Venezuela.

ROHWER (S. A.). *Acantholyda erythrocephala* (Linnaeus) in Pennsylvania.—*Jl. Wash. Acad. Sci.*, xvii, no. 7, p. 173. Baltimore, Md., 4th April 1927.

The occurrence of two males of the sawfly, *Acantholyda erythrocephala*, L., a pest of conifers in Europe, is recorded from Pennsylvania.

BROADBENT (B. M.). **Notes on the Habits and Development of the Azalea Leaf Miner, *Gracilaria azaleella* Brants.**—*Jl. Wash. Acad. Sci.*, xvii, no. 7, pp. 175–176. Baltimore, Md., 4th April 1927.

Only the author's abstract of this paper is published. *Gracilaria azaleella*, Brants, has now become established in New York, New Jersey, Pennsylvania, Florida and the District of Columbia [cf. *R.A.E.*, A, xii, 542]. Observations in a greenhouse show that the moth lays its eggs singly close to the midrib on the lower leaf surface. The larva hatches in about a week, at once enters the leaf, and feeds as a leaf-miner for 10–16 days, moulting twice before cutting its way out and becoming a leaf-roller. At first only the extreme tip is folded downward and attached to the midrib, but after each moult the larva cuts its way out, and moves to a fresh leaf where it rolls up and skeletonises a larger area. The larval period in April lasts 20–34 days, whereas the previous generation had required about 55 days. The larva pupates in the rolled leaf, the adult appearing in 7–16 days. One female observed laid 40 eggs. The adults live 1–9 days.

SNYDER (T. E.). **Insects change Building Code.**—*Jl. Wash. Acad. Sci.*, xvii, no. 7, p. 178. Baltimore, Md., 4th April 1927.

This paper, of which an abstract only is published, deals with the regulations necessary for the construction of buildings in order to protect them from the attack of subterranean termites [*R.A.E.*, A, xiii, 277]. In regions where non-subterranean termites are a serious menace, all interior wood-work and furniture must also be impregnated with zinc chloride or sodium fluoride.

BÖVING (A. G.). **Larvae of the Eumolpinae.**—*Jl. Wash. Acad. Sci.*, xvii, no. 7, p. 182. Baltimore, Md., 4th April 1927.

The author discusses the general characteristics of the larvae of Eumolpids and gives the individual characters of those of a number of closely allied species, including *Typophorus viridicyaneus*, Cr., from the roots of sweet potatoes, *T. (Paria) canellus*, F., *Fidia viticida*, Walsh, and *Colaspis* spp.

GREENE (C. T.). **Larvae of *Rhagoletis pomonella*, Walsh.**—*Jl. Wash. Acad. Sci.*, xvii, no. 7, p. 183. Baltimore, Md., 4th April 1927.

Larvae of *Rhagoletis pomonella*, Walsh, are recorded in prunes from New York State.

WATSON (J. R.). **Citrus Insects and Their Control.**—*Florida Agric. Expt. Sta.*, Bull. 183, pp. 293-423, 87 figs. Gainesville, Fla., June 1926. [Recd. April 1927.]

This paper is a revision of a bulletin already noticed [*R.A.E.*, A, vi, 473]. Additional information includes an account of the life-history and control of *Aphis pomi*, DeG. (*spiraccola*, Patch) and sections on entomogenous fungi by E. W. Berger, most of which have been noticed previously [*R.A.E.*, A, ix, 333]. The author follows T. Petch for the nomenclature of these fungi, which include *Nectria diploa* (*Microcera fujikuroi*), *Sphaerostilbe aurantiicola* (*coccophila*), and *Podonectria (Ophionectria) coccicola*.

DRAKE (C. J.) & HARRIS (H. M.). **Insect Enemies of Melons and Cucumbers in Iowa.**—*Iowa Agric. Expt. Sta.*, Circ. 90 revd. edn., 12 pp., 17 figs. Ames, Iowa, June 1926. [Recd. March 1927.]

This is a revised edition of a circular already noticed [*R.A.E.*, A, xii, 446]. Most of the damage by insects to cucurbits can be prevented by rotation of crops and clean cultural methods. Additional pests mentioned are cutworms, for the control of which two poison bran baits are recommended, flea-beetles, particularly *Epitrix cucumeris*, Harr. (potato flea-beetle) and *Systema taeniata* var. *blanda*, Melsh. (pale-striped flea-beetle), *Anasa armigera*, Say (horned squash bug) and *Macrosiphum gei*, Koch (*cucurbitae*, Midd.).

JAKUES (H. E.). **The 1924 Outbreak of Brood A of White Grubs in Iowa.**—*Proc. Iowa Acad. Sci.*, xxxii, pp. 423-424, 2 figs., 1 ref. Des Moines, 1925. [Recd. February 1927.]

For some 20 years, species of *Lachnosterna* (*Phyllophaga*) have been appearing each third year in sufficient numbers to cause serious damage throughout north-eastern Iowa. Their distribution in 1921 and 1924 is compared. Generally the larvae pupate about the middle of May, but in 1925 the attack continued for a month later, probably owing to weather conditions.

JOHNSON (C. W.). **Dipterological Notes.**—*Psyche*, xxxiv, no. 1, pp. 33-35. Boston, Mass., February 1927.

*Merodon equestris*, F. (narcissus bulb fly) has apparently been present in the vicinity of Boston, Massachusetts, for more than 50 years. Besides *Narcissus*, it is known to attack bulbs of *Vallota purpurea* and also many rare and beautiful hybrid forms of *Amaryllis*. Bulbs have been attacked both in the open and in greenhouses.

CRUMB (S. E.). U.S. Bur. Ent. **The Army Worms.**—*Bull. Brooklyn Ent. Soc.*, xxii, no. 1, pp. 41-55, 2 pls. Lancaster, Pa., February 1927.

A key is given to the species of Noctuid larvae that have the army-worm habit of migrating in numbers, with notes on their distribution in the United States, the character of the food-plants attacked by each species, and a description of the mature larvae.

Those dealt with include *Chorizagrotis auxiliaris*, Grote (also found in Canada); *Feltia gladiaria*, Morr.; *F. ducens*, Wlk.; *Cirphis unipuncta*, Haw.; *C. phragmitidicola*, Guen.; *C. pseudargyria*, Guen.; *Neoleucania albilinea*, Hb.; *Agrotis fennica*, Tausch. (also in Europe and Asia); *A. c-nigrum*, L. (also in Canada); *Lycophotia margaritosa*, Haw. (*saucia*, Hb.) (also in Canada); *Laphygma frugiperda*, S. & A. (also in West Indies and Mexico); *L. exigua*, Hb.; *Xylomyges* (*Prodenia*) *eridania*, Cram.; *Prodenia ornithogalli*, Guen., and *P. praefica*, Grote.

DUTTON (W. C.). **Notes on some of the Newer Spray Materials.**—*Qtrly. Bull. Michigan Agric. Expt. Sta.*, ix, no. 3, pp. 117-120. East Lansing, Mich., February 1927.

The author discusses some substitutes that have been suggested for some of the spraying materials recommended for Michigan conditions in a recent bulletin [*R.A.E.*, A, xiii, 258].

HEADDEN (W. P.). **Removal of Arsenate of Lead from Sprayed Fruit.**—*Colorado Expt. Sta.*, Press Bull. 63, 4 pp. Fort Collins, Colo., December 1926. [Recd. April 1927.]

Since the standard of 0.01 grain of arsenious oxide as the maximum permissible in a pound of fruit has been established, attempts have been made to find a method of removing the spray materials applied to apples. Wiping the fruit by hand or machine has proved expensive and unsatisfactory. Good results are said to have been obtained in

Oregon with a solution of one per cent. hydrochloric acid. As common table salt dissolves an arsenic solution, and common soda will decompose lead arsenate and will remove oils and dissolve some albumins, these two salts were tried in conjunction for the purpose of decomposing the lead arsenate even in the presence of an oil and a spreader. Four pounds each of soda ash ( $\text{Na}_2\text{CO}_3$ ), *i.e.*, washing soda from which all water has been expelled, and table salt ( $\text{NaCl}$ ) were dissolved in 100 lb. of water, and the solution then heated in wooden or iron vessels to 100° F. Weaker solutions did not give uniform results, and if heated to 122° F., slight injury to the apples seems to have occurred. Apples sufficient to cover the surface of the solution can be treated together and should be stirred gently with a mop for ten minutes, care being taken not to bruise the fruit. After removal from the solution the apples should be rinsed. Theoretically, 100 U.S. gals. of this solution to wash at least 1,000 boxes of apples carrying 0.05 gr. of arsenious oxide per lb., but present experiments have not been sufficient to justify this statement as proved. Certain directions and suggestions with regard to the use of suitable apparatus and methods of washing the fruit are appended, and it is hoped later to report upon a mechanical device for handling it in large quantities.

HODD (C. E.). **Fish Oil, an Efficient Adhesive in Arsenate-of-Lead Sprays.**—*U.S. Dept. Agric., Bull. 1439, 21 pp., 16 figs., 10 refs.* Washington, D.C., November 1926. [Recd. April 1927.]

Preliminary experiments were made on a small scale in 1921, 1922 and 1923 with various adhesive materials in combination with lead arsenate sprays, with particular reference to the control of the gipsy moth [*Porthetria dispar*], and during 1924 they were repeated on a large scale under natural conditions on deciduous trees and conifers in New Jersey and Massachusetts. Of the materials tried, the drying oils, linseed oil, fish oil and maize oil, were most effective, as with all of them the spray material resisted the action of rain throughout the season. The difference in the adhesiveness of linseed oil and fish oil is very slight, but as the latter is cheaper it should be used where a considerable amount of spraying is to be done. The formula used was 1 U.S. gal. oil and 25 lb. lead arsenate to 400 U.S. gals. water. Further experiments should be made to determine the value of this oil when added to other spray mixtures. The best results are obtained by adding the fish oil after the lead arsenate has been well mixed with the water and while the mixture is being well agitated. The mixture should be agitated throughout application in order to obtain an even coating of poison and maximum adhesiveness. Only the best grade of fish oil should be used; it is known as "light pressed" and is yellow to brown in colour. Cheaper grades are likely to clot, as they contain stearin. A good grade fish oil should have the following specification:—Saponification value, 190 to 193; iodine value, 139 to 193; specific gravity at 15° C. [59° F.], 0.927 to 0.933; free fatty acid, less than 5 per cent.

The chief adulterant is mineral oil, the presence of which is shown by a lowering of all of these characteristics.

Where only a few barrels of spray are to be applied, linseed oil may be used, as it is slightly more efficient than fish oil. Maize oil is not so good an adhesive as either of the above, but much more efficient than

any of the other materials tested ; these rank in the following order :—proprietary miscible oil, proprietary casein product, lead oleate, flour, and soap.

The mixtures containing fish oil adhere strongly to the undergrowth, and animals should not be allowed to graze during the season beneath the sprayed trees. During November 1924 the undergrowth was covered with lead arsenate 144 days after being sprayed with lead arsenate and maize oil.

PORTER (B. A.). U.S. Bur. Ent. **The Present Codling Moth Situation.**—*Trans. Illinois Hortic. Soc.*, 1926, lx, pp. 97–109. Springfield, Ill., 1927.

This is a general account of the life-history of the codling moth [*Cydia pomonella*, L.] and its control. The apparent failure of lead arsenate sprays to afford complete protection to the fruit is not necessarily the result of incorrect timing or faulty application, as in years of very heavy infestation many of the larvae are bound to escape the effects of the sprays and cause considerable injury to the apples. The various auxiliary measures, such as cleanliness in the orchard and stores and thorough treatment of all containers, are most important in preventing serious outbreaks and thereby increasing the efficacy of spraying.

FLINT (W. P.). **Experimental Work of the Natural History Survey on Codling Moth.**—*Trans. Illinois Hortic. Soc.*, 1926, lx, pp. 109–120. Springfield, Ill., 1927.

A series of experiments with various insecticides for the control of codling moth [*Cydia pomonella*, L.] were carried out in 1926 in Illinois. The materials tried were calcium and sodium fluosilicates, calcium arsenate, and lead arsenate, as sprays, and various dusts. The lowest amount of codling moth injury was obtained with the spray containing 2 lb. lead arsenate to 50 U.S. gals. of lime-sulphur or Bordeaux mixture. In the lead arsenate sprays hydrated lime was added at the rate of 2 lb. to 1 lb. lead arsenate. The fluosilicates at the same strength were ineffective, and the dusts on the whole were less effective than the sprays.

Lead arsenate, 1 lb. to 50 U.S. gals. of spray, was less effective than the stronger solution ; calcium arsenate (1 lb. to 50 U.S. gals.) compared fairly favourably with lead arsenate at the same strength though it caused a slight amount of scorching. It seems advisable, in seasons of great abundance of the pest, to use 2 lb. of lead arsenate to 50 U.S. gals. for the first brood and the first application for the second brood. Later applications, however, cannot be safely made with this amount of poison.

Of 92 analyses of different samples of fruit, only 3 showed an amount of arsenic above that considered safe, and these were all cases in which summer apples had been sprayed shortly before picking time. When the season is dry in late summer and early autumn, it is probable that more than the tolerated amount of residue will be present on fruit heavily sprayed in August. Brushing alone is not effective in removing this residue, and it is possible that the only safe way will be to pass the fruit through a bath of certain chemicals. The results of the experiments and observations in the field during the past season have

again emphasised the importance of the calyx spray. In order to fill the calyx cups before they close, this spray should be applied within 5 days after 90 per cent. of the petals have fallen.

The results of one season's work with summer oil sprays for the control of *C. pomonella* do not warrant their use in place of lead arsenate. In preliminary tests promising results were obtained against the eggs, but it is apparently impossible to kill the young larvae unless they come in contact with the oil shortly after it is applied. The disadvantage of oil as an ovicide is that egg-laying takes place daily from the beginning of July to the beginning of September.

MCMUNN (R. L.). **Spraying and Dusting Experiments in Johnson County, Illinois, 1926.**—*Trans. Illinois Hortic. Soc.*, 1926, lx, pp. 127–140. Springfield, Ill., 1927.

Details are given of experiments carried out against various fruit pests in 1926 by the use of fungicides, insecticides and combined sprays, the only insect on which any results were obtained being *Cydia* (*Carpeocapsa*) *pomonella*, L. (codling moth), which was very abundant. Owing to its numbers three extra applications of sprays and dusts were made, 10, 12 and 14 weeks after the calyx spray. The usual 9th week application against the second brood was applied at the 8th week.

On the whole the results confirm those described in the preceding paper, lead arsenate being the only spray that gave satisfactory control. Various factors caused the experiments with dusts to be inconclusive.

BROCK (W. S.). **Dusting Peaches.**—*Trans. Illinois Hortic. Soc.*, 1926, lx, pp. 141–146. Springfield, Ill., 1927.

The experiments begun in Illinois in 1924 [*R.A.E.*, A, xiv, 296] were continued in 1925, but no reliable data were obtained. The present report is concerned with operations in 1926. The same sulphur-lead arsenate dust [*loc. cit.*] was applied, and seven applications in all were made at intervals of from 10 days to 2 weeks throughout the season, beginning 1st May and ending 6th August. Sprays were also tested, five applications being made between 30th April and 24th July. The composition of the five sprays was as follows:—1½ lb. lead arsenate, 6 lb. hydrated lime and 50 U.S. gals. water; second spray the same; 12½ lb. dry-mix lime-sulphur, 1½ lb. lead arsenate and 50 U.S. gals. water; 3 lb. dritomic sulphur, 1½ lb. lead arsenate, 6 lb. hydrated lime and 50 U.S. gals. water; and 3 lb. dritomic sulphur in 50 U.S. gals. water.

Brown rot did not develop, and as it is directly dependent upon the control of curculio [*Conotrachelus nenuphar*, Hbst.], it may be assumed that this weevil was controlled. In the season under discussion the 7 dusts gave practically as good results as the 5 sprays, the percentage of peaches infested by the weevil being 1.8 on the dusted trees, 0.6 on the sprayed ones, and 82.5 on the controls. The difference between the dusted and sprayed plots may be accounted for by the variations in percentage of infestation at different points. During 1924 and 1925 the fruit on the whole showed a better colour on the dusted than on the sprayed plots. This effect was not noticed in 1926, probably owing to the absence of lime in the last liquid spray.

There is very little difference in the cost of spraying or dusting. The choice of time most suitable for dusting operations and the equipment required are briefly discussed.

COMPTON (C. C.). **Control of Insects attacking some of our Flowering Plants. Control of Insects on Truck Crops.**—*Trans. Illinois Hortic. Soc.*, 1926, lx, pp. 320-326, 408-418. Springfield, Ill., 1927.

In these two papers the insect pests dealt with, of which only the popular names are given, are arranged under the plants attacked. The type of injury is described, and recommendations for control are given, including formulae for the preparation of insecticides.

CHANDLER (S. C.). **The Season's Experiments and Observations on Codling Moth in Southern Illinois.**—*Trans. Illinois Hortic. Soc.*, 1926, lx, pp. 461-464. Springfield, Ill., 1927.

A number of proprietary oils have been tested on experimental plots for the control of codling moth [*Cydia pomonella*, L.]. Nearly all the oils tested killed all the eggs when used at a 2 per cent. strength, and in 7 out of 8 tests almost all were killed by a 1 per cent. strength. The mixture that failed at the weaker strength was a fish-oil soap emulsion containing a very light oil. The results were the same when lead arsenate was added to the oil emulsion.

The oil emulsions were of no use in preventing the larvae from entering the fruit unless they were combined with lead arsenate. When the latter was added at the rate of 1 lb. to 50 U.S. gals. of 2 per cent. oil emulsion, only 3 per cent. out of those placed on the apples managed to enter the fruit.

A certain amount of injury to the foliage was caused by all the oils at 2 per cent. strength, except by one that is described as 80 viscosity white oil with lead arsenate combined with the stock material. This oil was also tested in orchards with promising results, though no recommendations can be made at present.

MILLER (A. E.). **Habits and Control of Termites.**—*Illinois State Nat. Hist. Survey*, Entom. Ser. Circ. 10, 8 pp., 5 figs. Urbana, Ill., 1926. [Recd. March 1927.]

A brief popular account is given of the bionomics and control of termites, of which the most common species in Illinois is *Reculitermes flavipes*, Kollar. The annual loss caused by termites in the State is estimated at £200,000.

BROWN (F. M.). **Descriptions of New Bacteria found in Insects.**—*Amer. Mus. Novit.*, no. 251, 11 pp. New York, N.Y., 21st February 1927.

An account is given of several new bacteria obtained from various insects, including *Bacillus lasiocampa*, an organism that seemed to prevent the female of *Malacosoma americana*, F. (tent caterpillar moth) from laying eggs and *Alcaligines stevensae*, which was isolated in a pure culture from the crushed egg-masses of the same moth.

THORNE (G.). **Control of Sugar-beet Nematode by Crop Rotation.**—*U.S. Dept. Agric., Farmers' Bull.* 1514, 20 pp., 15 figs. Washington, D.C., November 1926. [Recd. April 1927.]

Most of the information contained in this bulletin on *Heterodera schachtii*, Schmidt (sugar-beet nematode) has already been noticed [*R.A.E.*, A, viii, 414; x, 404]. The present distribution is discussed, and it seems probable that every important sugar-beet section in the Western States will eventually become infested. No successful field method has been devised for the control of the Nematodes with chemicals. Sulphur, applied at the rate of 400 lb. an acre, thoroughly disked and harrowed into the soil, had no effect, and although calcium cyanide applied at the rate of 800 lb. or more to the acre and ploughed in to a depth of 10–12 inches reduced the infestation to a certain extent, the following year the plot was again severely infested. In planning crop rotation for the control of Nematodes the points to be considered are the severity of infestation, the profitable crops adapted to the field and the general fertility of the soil. Light infestations may be controlled by rotations of one, or preferably two years; moderate infestations by rotations of two or three years; and severe infestations by rotations of not less than three and preferably four or five years. The value of individual rotation crops is discussed, and a table showing the results of various crop rotations in actual field practice is given.

BRAUN (A. F.). **A New Species of *Holcocera* predaceous on Mealybugs (*Microlepidoptera*).**—*Ent. News*, xxxviii, no. 4, p. 118. Philadelphia, Pa., April 1927.

The Tineid, *Holcocera phenacocci*, sp. n., is recorded from California; the larva is thought to be predacious on *Phenacoccus colemani*, Ehrh.

MORRILL (A. W.). **Fighting Pests with Airplanes.**—*Calif. Cult.*, lxvii, no. 3, pp. 53, 71, 1 fig. 1926. (Abstract in *Expt. Sta. Rec.*, lvi, no. 1, p. 57. Washington, D.C., January 1927.)

It has been demonstrated on the west coast of Mexico that large areas of vegetable crops can be treated successfully and economically with insecticides and fungicides distributed from aeroplanes [*R.A.E.*, A, xiv, 646]. The best height for machine to travel at is about 8–10 feet above the tops of the plants. Calcium arsenate may thus be effectively distributed for a distance of about 75 ft. on each side of the aeroplane.

HUTSON (R.). **Non-inflammable Fumigant for Use against Wax Moth (*Galleria mellonella*, L.).**—*Amer. Bee Jl.*, lxvi, no. 6, pp. 273–274. 1926. (Abstract in *Expt. Sta. Rec.*, lvi, no. 1, p. 61. Washington, D.C., January 1927.)

The larvae and pupae of *Galleria mellonella*, L. (wax moth) may be killed by exposure for 48 hours, at a temperature of 69–85°F., to ethyl acetate combined with carbon tetrachloride in the proportion of 30 lb. or more to 1,000 cu. ft.

MUESEBECK (C. F. W.). U.S. Bur. Ent. **A Revision of the Parasitic Wasps of the Subfamily Braconinae occurring in America north of Mexico.**—*Proc. U.S. Nat. Mus.*, lxi, art. 16, no. 2642, pp. 1-73, 2 pls. Washington, D.C., 1927.

This is a detailed study of the AGATHINAE (BRACONINAE) of America north of Mexico, made for the purpose of facilitating the identification of the species occurring in that region, and based upon the collection in the United States National Museum. Keys are given to the genera and species, with descriptions of a number of new species.

[**Entomological Investigations.**]—*Ann. Repts. Wisconsin Agric. Expt. Sta. 1924-1926*, Bull. 388, pp. 60-75, 11 figs. Madison, Wis., December 1926. [Recd. 1927.]

Of the various insects attacking tobacco in Wisconsin grasshoppers were the most serious pests. The planting of several rows of maize as a screen or the scattering of poison baits around the edges of tobacco fields were the control measures successfully adopted. Of damage inflicted by other pests the most serious is seed-bed injury by the flea-beetle, *Epitrix parvula*, F., which may, however, be controlled by dusting with calcium fluosilicate or sodium silicofluoride without injury to the plants. In one region the black cherry aphid, *Myzus cerasi*, F., has been particularly injurious to certain varieties of cherry in the neighbourhood of woods. By the end of September autumn migrants were numerous on all the trees under observation. The offspring of these forms were sexual females, which fed on leaves in small colonies and were fertilised by winged males, which appeared on cherry in October. Each female is capable of laying one to six eggs, which are deposited on the bases of the buds, the bark or the leaves, and, if fertile, turn to a shiny black colour in three days. In spring this Aphid produced only apterous forms in the first and second generation, part of the third being winged, while the fourth and succeeding generations were all winged and left the cherry trees in search of secondary food-plants. If the individuals of the latter generations are reared separately they always give rise to apterous forms. These cannot produce the autumnal sexual forms on cherry, and die off. The winged forms, or spring migrants, do not reproduce or feed on cherry leaves after reaching maturity. The alternative food-plant in Wisconsin, which had been unknown up to 1926, was discovered to be wild pepper-grass, *Lepidium* sp. In spring the buds and tender foliage are the point of attack, infested leaves curling and having a stunted growth. Yellowing and premature defoliation sometimes take place below the point of infestation. A dust made by adding 2 U.S. pints 40 per cent. nicotine sulphate to 50 lb. hydrated lime, stirred in with coarse gravel that was afterwards screened off, proved fairly satisfactory, but is probably too expensive for practical use. As a petal spray a new commercial insecticide (derrisol) imported from England proved the most promising of various materials tried.

A second outbreak of the Geometrid, *Ellopija fascellaria*, Gn., occurred on hemlock [*Tsuga*] in June 1926 [*R.A.E.*, A, xiv, 79]. The infested area of hemlock forest was completely stripped. To control the insects about 15,000 lb. calcium arsenate was distributed by aeroplane over about 1,000 acres of infested forest. After the treatment as many as 98 dead larvae to the square yard were found on cheese-cloth placed

under the trees, and the mortality was estimated at 90 per cent. in the hemlock forest and at over 80 per cent. in the mixed forest areas. The eggs of this moth are deposited on the foliage or bark in late September and hatch in the following June. The larvae, which become mature in August, spin threads that entwine the twigs and needles into a web-like mass. Of the trees thus attacked 90 per cent. die, and those that recover are in a very weakened condition.

After the successful campaign conducted against grasshoppers in 1924 very few were found in the ensuing season. Operations were therefore transferred to areas hitherto untreated. The bait formula in use in Wisconsin [*R.A.E.*, A, xiii, 242] was rendered even cheaper in 1925 by the omission of molasses. Old bait proved as effective as new when moistened by dew or rain. It was discovered that temperature is the most important factor affecting the feeding of the grasshoppers and that applications were equally effective at any time of day, provided that the temperature was between 72 and 84° F. If properly spread, at the rate of 10–20 lb. an acre, the bait does not cause injury to livestock.

Experiments to discover the best date for planting wheat to avoid damage by *Mayetiola destructor*, Say, which caused 20 per cent. losses in one area, showed that early plantings in autumn were more heavily infested than late ones, though in the spring the fly was more abundant on late plantings. More of the late-sown wheat dies in the winter, and on the whole early planting seems to give a rather better yield.

Studies on the natural enemies of *Illinoia pisi*, Kalt. [*R.A.E.*, A, xiii, 514] have been continued. Of the 70 known, 41 have been found in Wisconsin, and damage by this Aphid was slight in 1925, although it appeared on clover and lucerne early in the season.

WEBSTER (R. L.). **Entomology Biennium July 1, 1923, to June 30, 1925.**—*N. Dakota Agric. Expt. Sta.*, Bull. 194, pp. 58–60. Fargo, N.D., January 1926. [Recd. 1927.]

Studies of insects on potato in North Dakota showed that the green form of *Macrosiphum gei*, Koch (*solanifolii*, Ashm.) is more common than the pink form. This Aphid, which disseminates potato mosaic, hibernates on cultivated roses, but was not observed in any abundance on wild rose bushes, which are very numerous in North Dakota [*cf.* *R.A.E.*, A, xiii, 275, 434]. It was found that calcium arsenate and Bordeaux mixture gave more protection against the potato flea-beetle, *Epitrix cucumeris*, Harr., than calcium arsenate alone. Considerable damage was done by *Gryllus assimilis*, F., to the lucerne seed crop in 1924, the crickets actually feeding on the seed pods. Little success was obtained with bran baits poisoned with sodium arsenite or sodium fluoride, though in powdered form the latter gave excellent results for killing crickets on a small scale and keeping them out of houses. Calcium cyanide was found to be of little value. Damage to wheat was caused by *Mayetiola destructor*, Say (Hessian fly) over a large area of the western part of the State in 1924. The size of the supplementary midsummer brood, to which the chief damage is due, is known to be affected by rainfall, but no conclusive evidence was obtained in an effort made to correlate the prevalence of the fly in 1924 with the rainfall during June of that year.

GILLETTE (C. P.). **Report of the Entomologist.**—*39th Ann. Rept. Colorado Agric. Expt. Sta., 1926*, pp. 30–32. Fort Collins, Colo. [1927.]

*Macrodactylus subspinosus*, F., appeared in Colorado in the summer of 1926. The alfalfa weevil [*Hypera variabilis*, Hbst.] occurred in previously uninfested areas, probably owing to spread from Wyoming. Lead arsenate sprays have been successful in the control of the codling moth [*Cydia pomonella*, L.] in one district, but in the extreme west, where an additional annual brood occurs, the results have been discouraging. Bait-traps, however, give promise of being a valuable supplementary measure. Control measures against grasshoppers have been so systematically carried out during the past four years that damage from this source was well below the average in 1926.

DOOLITTLE (S. P.) & WALKER (M. N.). **Control of Cucumber Mosaic by Eradication of Wild Host Plants.**—*U.S. Dept. Agric., Dept. Bull. 1461*, 14 pp., 11 refs., 3 pls. Washington, D.C., November 1926. [Recd. April 1927.]

Field experiments in Wisconsin and Illinois from 1920 to 1924 demonstrated that cucumber mosaic can be controlled in an isolated field by the removal of wild plants susceptible to the disease, and that this method may greatly reduce loss from mosaic when applied to larger areas. The importance of such plants in carrying the disease over the winter is discussed [*R.A.E.*, A, xiv, 12, 163]. Rotation planting of cucumber is advisable for the control of various diseases, and in the case of mosaic it is necessary to remove the crop from a position where the gradual accumulation of a reservoir of the virus in perennial weeds would serve as a source of infection during following seasons. The field should be surrounded by other cultivated crops. All plants known to harbour mosaic over the winter should be kept from the field itself and for 50 to 75 yds. around it. Cucumber plants in which mosaic appears early in the season should be removed and the field should be sprayed or dusted regularly to keep down *Aphis gossypii*, Glov., and *Diabrotica*, the vectors of the disease. Where fields are close together, it is important that growers should co-operate to remove sources of infection in the neighbourhood. Reductions of infestation secured in experiments with these methods were from 39 per cent. to 3 per cent. in one case and from 100 per cent. to 10 per cent. in another.

DUNNAM (E. W.). U.S. Bur. Ent. **Notes on the Life History and Control of the Strawberry Leaf Roller.**—*Jl. Agric. Res.*, xxxiv, no. 2, pp. 149–156. Washington, D.C., 15th January 1927.

This paper gives an account of the life-history of *Ancylis comptana*, Fröhl. (strawberry leaf-roller) as observed during the summer of 1923 in Iowa. The total life-cycle averaged 42.5 days, the incubation period 7.9, the larval period 22.7, the pupal period 9.6, and the pre-oviposition period 2.3. The average number of eggs laid by one individual was 85.1. The studies were limited to the first generation, most of the larvae of which had pupated by 29th June when many moths had already emerged. The moths of the second generation emerged about 10th August, the eggs deposited by them giving rise to

the larvae that hibernate. The larva feeds on the epidermis of the strawberry leaf, causing the remaining tissues to turn brown and die. In addition to some of the parasites already noticed [*R.A.E.*, A, xiii, 514] the following were bred from the larvae: *Hoplocryptus incertulus*, D.T., *Spilocryptus polychrosidis*, Cushman, and *Spilochalcis albifrons*, Walsh. In control experiments carried out during 1923, dusts, which were applied at the rate of 25 lb. to the acre, proved more successful than sprays. Almost complete control was secured with a mixture of 1 lb. lead arsenate to 5 lb. gypsum, while 1 lb. lead arsenate to 5 lb. slaked lime and 1 lb. calcium arsenate to 10 lb. gypsum were nearly as good. A mixture of 1 lb. calcium arsenate to 10 lb. slaked lime gave about the same result as the most satisfactory spray, which consisted of 1 lb. lead arsenate to 50 U.S. gals. water, applied at the rate of 100 U.S. gals. to the acre. The plants on the control plots were completely defoliated. As it is impossible to kill the larvae and pupae in rolled leaves, the insecticides were applied about 27th June and 29th July, when the moths were beginning to oviposit for the second and third generation respectively, in order to poison the young larvae as they hatched and started to feed.

**Quarantine on account of Japanese Beetle. Notice of Quarantine no. 48, with Regulations (Fifth Revision).**—*U.S. Dept. Agric., Fed. Hortic. Bd.*, S.R.A., no. 89, pp. 118–124. Washington, D.C., March 1927.

The previous revision of Quarantine no. 48, with the supplementary Rules and Regulations [*R.A.E.*, A, xv, 3], is here superseded as from 11th October 1926. The area quarantined on account of *Popillia japonica*, Newm., is revised to include infested areas in New York and Connecticut as well as in the previously infested States of New Jersey, Pennsylvania and Delaware.

**Quarantine on account of Japanese Beetle. Rules and Regulations (Sixth Revision) supplemental to Notice of Quarantine no. 48.**—*U.S. Dept. Agric., Fed. Hortic. Bd.*, 10 pp., 1 map. Washington, D.C., 21st March 1927.

These revised regulations, which became effective 1st April 1927, do not materially alter the restrictions enforced, but incorporate under the appropriate regulations matters hitherto included in the appendix. A map is given showing the area under regulation on account of *Popillia japonica*, Newm.

CLAUSEN (C. P.), KING (J. L.) & TERANISHI (C.). **The Parasites of *Popillia japonica* in Japan and Chosen (Korea) and their Introduction into the United States.** *U.S. Dept. Agric., Dept. Bull.* 1429, 55 pp., 1 pl., 35 figs. Washington, D.C., January 1927. [Recd. April 1927.]

A study of the parasites of *Popillia japonica*, Newm., in Japan and Korea has revealed nine species parasitic on this or related hosts. A chart including all except *Eutrixopsis javana*, Towns., shows their time of appearance and the stage of the host attacked. Some of those mentioned have already been introduced into the United States and

become established [*R.A.E.*, A, xiv, 155]. All, with the exception of the two Dexiids, pass the winter in the pupal stage, these two species remaining as early-stage larvae within the host larvae. The observations described were made in Japan unless otherwise stated. Among the Tachinids the most promising is *Centeter cinerea*, Ald. [*R.A.E.*, A, xii, 172]. The manner of ovipositing in the host is unusual. As the adults of *P. japonica* take alarm at the approach of the parasite and frequently drop to the ground, the latter waits until it can attack a mating pair, and then runs diagonally across the thorax of the female, pausing for an instant to deposit an egg; thus 85 to 96 per cent. of the eggs are deposited upon female beetles. In the field, oviposition ranges over about 2 weeks, over 100 eggs being laid by some of the females. The young larva, while still in the egg-shell, drills an entrance into the thoracic cavity of the host, the penetration of the hard exoskeleton being rendered possible by a modification in the structure of the tip of the mouth-parts, which is provided with a row of heavy teeth. Larvae from eggs deposited on any other part of the body generally fail to effect an entrance. When the entire body content of the host is consumed, the parasite pupates in the dead body of the beetle. The vital organs of a female host are attacked sooner than those of a male and consequently death occurs sooner. Shortly before death, the beetle buries itself in the soil and thus the parasite, being within the body, is provided with an air-filled chamber within which to pass the dormant period. In general, conditions suitable for the host are nearly ideal for this parasite. The characters for determining the immature stages of *C. cinerea* and of some of the other important parasites dealt with are enumerated. In a large consignment of this parasite, there was a considerable infestation of Chalcid hyperparasites, of which the most important was *Spalangia* sp.

Another Tachinid, *Ochremeigenia ormioides*, Towns., has been investigated in Yokohama [*R.A.E.*, A, xiv, 542]. There are three generations of this fly in a year, the first two of which parasitise *P. japonica*, the third developing in allied beetles. The females apparently deposit larvae, the method of penetration into the host being unknown. The puparia are formed within the beetle and buried in the ground with it as in the case of *C. cinerea*, the pupal stage lasting from 11 to 13 days. The fly has also been reared from adults of *Anomala rufocuprea*, Motsch., and *A. (Phyllopertha) orientalis*, Waterh., and (in Korea) from *Popillia mutans*, Newm. *Eutrixopsis javana* is a Tachinid of secondary importance as a parasite; its life-cycle apparently corresponds closely to that of *C. cinerea*, there being only one generation in a year.

The rearing of the Dexiid, *Prosenia siberita*, F. [*R.A.E.*, A, xii, 173] presented considerable difficulty. Examination showed that the ovarian sac in a gravid female contained over 800 eggs and larvae, the latter being located in the terminal portion of the sac, and when the wall of the sac was broken with a scalpel or needle the young larvae crawled quickly away. This method was adopted in the breeding work, the larvae being transferred to the host by means of a fine brush. Practically 100 per cent. of these inoculations were effective. After the body content of the host is completely devoured, the parasite larva emerges and pupates in the soil an inch or two below the body of the host. The various stages of this parasite are not uniform in duration; after entrance into the host is effected the parasite larva may remain in the first stage until the following spring. *Dexia ventralis*,

Ald., is the commonest Dexiid in Korea, and its life-history is described at length. It is doubtful whether this parasite can increase to a point where it will be of value as a check to *P. japonica*, for of the normal three generations a year probably only one could attack *P. japonica*.

Among the Scoliids, *Campsomeris annulata*, F., was taken in rather small numbers in Korea and also occurs in Japan. It is probable that *Anomala* sp. is the true host of the late generations, though species of *Popillia*, including *P. japonica*, serve equally well when present. The complete life-history is not known. The eggs are very insecurely attached to the ventral surface of the abdomen of the host larva and are frequently rubbed off by the movements of its body. The size of the adult parasite indicates that it can produce normal-sized progeny only on *Popillia* larvae that have reached maturity, and as these are not present during the summer months in any quantity, there must either be some other host available or adult life must be prolonged until suitable grubs occur. Of the species of *Tiphia*, *T. popilliavora*, Rohw., only occurs locally in Japan and Korea and does not parasitise more than 20 per cent. of the larvae of *P. japonica*; it occurs during late August and early September, and prefers grubs in the early or middle third stage for oviposition. *T. vernalis*, Rohw., occurs in Korea during May and early June; it parasitises some 10 per cent. of native species of *Popillia* and readily attacks *P. japonica*. *T. koreana*, Rohw., is present in Korea in August and is normally parasitic upon *Anomala* sp., though *P. japonica* is also accepted. The average degree of parasitism is 20 per cent., though this may at times rise to 76 per cent. A key is given for the determination of the adults of these three species of *Tiphia*.

The life-history and habits of the Carabid, *Craspedonotus tibialis*, Schaum, which is predacious on *P. japonica*, are described, but attempts to establish it in America were unsuccessful.

The life-cycle and seasonal history of *P. japonica* in Japan is discussed in detail [R.A.E., A, xii, 173] and a complete list of its food-plants is given. In Korea, 3 species of *Popillia* occur, and the known parasites of these species have in every case attacked *P. japonica* readily when brought into contact with it.

RICHMOND (E. A.). **Olfactory Response of the Japanese Beetle** (*Popillia japonica*, Newm.).—*Proc. Ent. Soc. Wash.*, xxix, no. 2, pp. 36-44, 17 refs. Washington, D.C., February 1927.

A general review is given of the investigations made during the last few years for the purpose of discovering chemicals with odours attractive to the Japanese beetle *Popillia japonica*, Newm.. The most promising chemicals in this respect were geraniol, eugenol, citronellal, citral, citronellol and diphenyl ether, the relative values of which are discussed. Geraniol at 10 per cent. strength attracted the most beetles, but when the collections were calculated on a percentage basis the lower strengths gave increasingly better returns. It was found that with a combination of geraniol and eugenol (the second best attractive agent) the amount of geraniol could be considerably reduced and only 0.25 per cent. of eugenol was necessary; this rendered the bait both cheaper and more effective. These chemicals, with a bait-carrier, were used in a cylindrical bait-trap, the efficiency of the traps being greatly improved by the addition of a large wash-tub half

full of water placed directly beneath the trap. Over 13,000 beetles were taken in a single trap during a period of about eight hours. The addition of geraniol, 1 : 1,000, to the usual lead arsenate spray was extremely efficacious in attracting beetles, but the odour dissipated too rapidly. Geraniol emulsion with oleoresin of pyrethrum spray was used with success. No entirely satisfactory poison bait has been discovered, but lead chloride, sodium arsenite, sodium arsenate and Paris green produced a high mortality. Crushed apples with lead arsenate were readily eaten and gave better results than when lead chloride was used. Geraniol itself is toxic to the beetle, and it may be that no poison need be added. Many tests with repellents have also been made, the most successful ones being copper resinate, guaiac wood oil and oil of tar. Kieselguhr and talc were very satisfactory as carriers and doubtless increase the repellent action. A brief description of geraniol ( $C_{10}H_{18}O$ ) is given. The adults of *P. japonica* are exceedingly susceptible to colour, odour, temperature, humidity and light, and an odour may be repellent, neutral or attractive to them according to the temperature-humidity relationship. Females are attracted approximately one-third more frequently than males when geraniol and most other chemicals are used.

**Moth Control to meet Residue Edict.**—*Better Fruit*, xxi, no. 10, pp. 11–12. Portland, Oregon, April 1927.

As it is expected that the requirements with regard to arsenic residues on apples will be more strictly enforced in 1927 than in the previous year, the Yakima Growers' Spray Residue Committee have drawn up recommendations for the control of the codling moth [*Cydia pomonella*, L.], details of which are here given.

The time and number of applications of lead arsenate must necessarily vary in different orchards and will have to be determined by each individual grower. Oil sprays should only be used for experimental purposes. As a rule 1 lb. lead arsenate to 50 U.S. gals. is sufficient, but where heavier applications are required they should not exceed 1½ lb. to 50 U.S. gals., and should not be applied later than the second cover spray. Supplementary measures include the destruction of overwintering larvae in warehouses, the use of bands, scraping the trees, and trapping the adults before oviposition by placing the traps well up in the trees before the calyx spray is applied. Fruit clusters should be thinned and all infested fruit destroyed, not buried.

HEADLEE (T. J.). **Report of the Department of Entomology.**—*Rept. New Jersey Agric. Expt. Sta., 1924–25*, pp. 359–433, 16 refs. New Brunswick, N.J., 1926. [Recd. April 1927.]

A list is given of the insects recorded in New Jersey during the year with the locality and date of their occurrence. Pests that were unusually numerous in orchards include *Paratetranychus pilosus*, C. & F., the apple Aphids, *Aphis pomi*, DeG., *A. sorbi*, Kalt., and *A. avenae*, F., and *Myzus persicae*, Sulz., on peach. Though *Popillia japonica*, Newm., continued to spread, control measures rendered the damage to fruit almost negligible. Much is hoped for the introduction of parasites from Japan. The stalk-borer, *Papaipema nitela*, Gn.,

was conspicuous in gardens and *Thyridopteryx ephemeraeformis*, Haw., was numerous. *Paratenodera sinensis*, Sauss., a mantis that feeds on Aphids and other injurious insects, has been unusually abundant.

Endeavours were made to extend the previous studies for the prevention of injury to stored grain, etc., by mixing it with dust materials [*R.A.E.*, A, xiv, 145] to the protection of wheat from *Sitotroga cerealella*, Ol. In view of the difficulty of maintaining constant relative humidity, the results obtained were not conclusive, but the author believes that *S. cerealella* may be repelled by small amounts of dusts.

Experiments against *Aphis avenae* with about 300 different materials or combinations of them as ovicides showed that soluble sulphur (sodium sulphur) is no more efficient than lime-sulphur, and confirmed the conclusion that the percentage of eggs destroyed by miscible oils is not so great as the percentage destroyed by lime-sulphur to which nicotine sulphate has been added. In tests of insecticides used against *Myzus persicae*, at a stage when the peach foliage had been curled and the calyces penetrated, nicotine sulphate and soap proved most effective, though nicotine sulphate and dry-mix lime-sulphur, which provided against brown rot, was probably the most practical. Owing to the concentration of the material on the upper parts of the tree, where it is fairly effectual, dust insecticides have relatively little effect on the basal parts. Though a certain amount of control can be effected at so advanced a stage, the best period to apply remedial measures is just before the eggs hatch.

Investigations to determine the relative values in the control of the codling moth [*Cydia pomonella*, L.], etc., on apples of a 65-20-15 sulphur-lime-lead arsenate dust in which a special sticker had been incorporated and a spray consisting of 8 lb. of sulphur, 4 lb. of lime, 2 lb. of powdered lead arsenate and 1½ lb. of casein-lime showed the dust application to be more costly and less effective. In the case of early fruit, dust permitted the injury of 12.3 per cent. of the apples as compared with 7.2 per cent. on sprayed trees, while in the case of later fruits the percentages of damage were 47.5 and 24.6 respectively. Lead arsenate coated with lead oleate gave less favourable results than the regular spray and caused some foliage injury. Other investigations on *C. pomonella* have already been noticed [*R.A.E.*, A, xiii, 255].

Further tests were made against wireworms [*cf. R.A.E.*, A, xiv, 146] with calcium cyanide at the rate of 0.11 oz. and carbon bisulphide emulsion at the rate of 0.67 oz. in 1 U.S. qt. of water to 1 sq. ft., applications being made in April when the temperature of the soil was 50°F. Six days later, in check holes sunk to a depth of 2 ft., 27 wireworms were found in the control plot, 12 in that treated with carbon bisulphide and 10 in that treated with calcium cyanide. In another set of experiments begun on 28th May the applications to 1 sq. ft. were 1 U.S. qt. water containing 0.96 liquid ounces of actual carbon bisulphide and 0.126 ounces calcium cyanide, the temperature of the soil being 60°F. Examinations made on 3rd June showed 31 live wireworms in the control plot, 2 live and 46 dead in the carbon bisulphide plot and 9 live and 43 dead in the calcium cyanide plot. From data obtained from 1923 to 1925 it appears that either calcium cyanide or carbon bisulphide must be applied when the plants are not in the ground, preferably at a time when the soil can be turned with the plough, and that calcium cyanide can be applied at about one quarter of the cost of carbon bisulphide.

RUDOLFS (W.). **Some Chemical Information regarding Apple Tree Tent Caterpillar.**—*Rept. New Jersey Agric. Expt. Sta., 1924-25*, pp. 376-377. New Brunswick, N.J., 1926. [Recd. April 1927.]

On the assumption of the existence of an optimum amount of water in the body of an insect permitting metabolic changes to occur at maximum speed, varying for the different stages, studies were undertaken to determine the following constituents of the eggs, larvae, pupae and adults of *Malacosoma americana*, F.: moisture, total nitrogen and sulphates (proteins), fats, total ash and soluble ash (the latter being mainly carbonates). The moisture content of the eggs showed a gradual decrease, reaching a minimum with the hatching of the larvae, the fat content decreasing simultaneously, while nitrogen increased. The moisture and fat contents increased rapidly as soon as the larvae started to feed, and the total nitrogen decreased slightly. When a certain optimum moisture content was reached, ether-soluble material increased to 15 per cent., and when the larvae were ready for pupation their fat content reached 18.7 per cent. This proportion increased to 24 per cent. in the pre-pupal and 28.8 per cent. in the pupal stage. When the pupae were nearly ready for emergence the fat content was reduced to 26 per cent. and the adults contained 24.7 per cent. of fat. The calculations given show that a certain definite mutual relation exists between the various constituents for the different parts of the life-cycle.

PETERSON (A.). **A Report on Biological Studies of the Oriental Peach Moth (*Laspeyresia molesta*, Busck) for 1924.**—*Rept. New Jersey Agric. Expt. Sta., 1924-25*, pp. 379-386, 1 ref. New Brunswick, N.J., 1926. [Recd. April 1927.]

Life-history studies of *Cydia (Laspeyresia) molesta*, Busck, showed that under insectary conditions there are four generations a year in New Jersey. The first adults appear in May and the total life-cycle of each brood averages from 37 to 40 days. The third and fourth generations are the most numerous, the latter occurring in September and October and over-wintering as larvae. Tables are given showing the detailed results of life-history studies of *C. molesta* on caged trees and observations on the development and abundance of larvae on twigs collected at weekly intervals from young orchards in four different parts of the State. In the field the third and fourth broods appear to overlap.

STEARNS (L. A.). **Oriental Peach Moth Investigations.**—*Rept. New Jersey Agric. Expt. Sta., 1924-25*, pp. 386-402. New Brunswick, N.J., 1926. [Recd. April 1927.]

Most of the information contained in this paper has already been noticed [*R.A.E.*, A, xiii, 253]. Attempts to control the adults of the oriental peach moth [*Cydia molesta*, Busck] by means of the installation in orchards of electric lights, under which large pans containing water and kerosene or metal cones over bottles filled with calcium cyanide were placed, showed the system to be of no practical benefit. A slaked lime and lime-sulphur wash brushed on the trunks of peach trees in April proved quite ineffective. In fumigation experiments with both

larvae and pupae of *C. molesta* in hibernacula at exposures varying from 15 minutes to 7 hours at a temperature of 60°F., using calcium cyanide 40 to 50 per cent. at dosages of 1, 2 and 3 lb. to 1,000 cu. ft. of space, no pupae were killed at any dosage during the entire exposure period, but all larvae succumbed at all dosages after exposures of 3 hours and upwards. Preliminary tests against the hibernacula with lime-sulphur, nicotine sulphate, various commercial oils and coal-tar derivatives, etc., were decidedly negative.

BECKWITH (C. S.) & DRIGGERS (B. F.).—**Report of Cranberry Substation.**—*Rept. New Jersey Agric. Expt. Sta., 1924-25*, pp. 414-421. New Brunswick, N.J., 1926. [Recd. April 1927.]

The most serious infestation yet recorded of *Crambus hortuellus*, Hb. (cranberry girdler) occurred in 1924, largely owing to dry weather during the larval period, following upon a slighter increase in 1923 when no control was practised. The control measures at present used include submerging the infested bog during the larval stage [*R.A.E.*, A, xiii, 380], which requires to be repeated every three years; burning the plants when the ground is frozen to destroy the runners upon which all the feeding of the larvae is done; and covering the runners with sand, which accomplishes the same result but is more expensive. There is no crop the first year after burning, and the plants may be killed if they have been previously severely injured by the girdler. Flooding in September has been found to control the blossom worm, *Epiglaea apiata*, Grote. In one series of experiments a coat of lead arsenate kept on the cranberry plants from 1st July to 1st September gave a 10 per cent. increase in the crop, though no particular insect appeared to be prevalent.

HUTSON (R.). **Bee Investigations.**—*Rept. New Jersey Agric. Expt. Sta., 1924-25*, pp. 423-432, 11 refs. New Brunswick, N.J., 1926. [Recd. April 1927.]

The investigations carried out during 1924-25 included pollination studies, the testing of strains resistant to European foulbrood and experiments with chlorine gas as a disinfectant for combs infected with American foulbrood.

VAN DYKE (E. C.). *Coccotrypes dactyliperda*, **Fab.**—*Pan-Pacific Ent.*, iii, no. 3, p. 151. San Francisco, Cal., January 1927.

The Scolytid, *Coccotrypes dactyliperda*, F., is a native of Africa and Asia and breeds in the seeds of the date and betelnut [*Areca catechu*]. It has recently been found in California infesting seeds of an ornamental palm (*Phoenix canariensis*). It is hoped that it will not become established in the date groves of the Coachella Valley.

[**Insects Pests in Idaho in 1925.**]—*Idaho Agric. Expt. Sta., Bull. 142*, pp. 16-17. Moscow, Ida., January 1926. [Recd. April 1927.]

Wireworms were responsible for the chief damage to crops in Idaho in 1925, vegetables, cereals, bulbs, etc., suffering severely. The codling moth [*Cydia pomonella*] on apples and the seed corn maggot [*Phorbia cilicrura*] on beans were also important pests. Low winter

temperatures proved fatal to about 95 per cent. of the alfalfa weevil [*Hypera variabilis*], about 87 per cent. of the eggs of the fruit-tree leaf-roller [*Tortrix argyrospila*] and 99 per cent. of those of the snowy tree-cricket [*Oecanthus niveus*]. Codling moth larvae and San José scale [*Aspidiotus perniciosus*] were also killed in large numbers. Parasitism of *H. variabilis* by *Bathyplectes curculionis*, which had reached 25 per cent. in the previous year [*R.A.E.*, A, xiii, 500], was found to be as high as 50 per cent. in some fields. Aphids on plum trees were practically exterminated by a spray of  $\frac{1}{2}$  per cent. engine oil and 40 per cent. nicotine sulphate at the rate of  $\frac{3}{16}$  pint to 100 gals.

CORY (E. M.). **Insects of the Year [1926].**—*Trans. Peninsula Hortic. Soc.*, xvi, no. 3, pp. 14–15. Dover, Del., 1927.

The oriental peach moth [*Cydia molesta*, Busck] is considered to be the most pressing problem in Maryland. It is a most important pest of peaches and quinces and shows every indication of becoming a serious enemy of apples. The larvae enter the fruit so late that they may easily be overlooked. Fruit baskets frequently harbour a number of cocoons, and if this infestation is not cleared up, apples will suffer severe damage in the following season.

HEADLEE (T. J.). **An Operation in Practical Control of Codling Moth in a heavily infested District.**—*Trans. Peninsula Hortic. Soc.*, xvi, no. 3, pp. 16–25. Dover, Del., 1927.

This paper on measures against the codling moth [*Cydia pomonella*] in New Jersey has been noticed from another source [*R.A.E.*, A, xv, 259].

DOUGLASS (B. W.). **Successful Codling Moth Control.**—*Trans. Peninsula Hortic. Soc.*, xvi, no. 3, pp. 25–28. Dover, Del., 1927.

The author considers that lax methods of spraying are largely responsible for the increase of the codling moth [*Cydia pomonella*, L.] of recent years in Delaware. He is convinced that the pest can be controlled in any orchard if the right material is properly used, and emphasises the necessity of thoroughly soaking the trees. Any arsenical suitable for use on apples will kill the larvae, but it should be used at least as strong as, or stronger than, the amount advised. The author's method, which gave excellent results, was to get rid of as many overwintering insects as possible and then spray three times with  $1\frac{1}{2}$  lb. lead arsenate to 50 U.S. gals., viz., a "pink" spray, a calyx spray, and one about 1st July, when the second brood of moths emerges.

FLINT (W. P.) & BIGGER (J. H.). **The Fruit Tree Leaf Roller and its Control under Illinois Conditions.**—*Illinois State Nat. Hist. Surv.*, Ent. Ser. Circ. 9, 12 pp., 3 figs. Urbana, Ill., 1926. [Recd. April 1927.]

The bionomics of *Tortrix* (*Archips*) *argyrospila*, Wlk. (fruit-tree leaf-roller), which has become very destructive in certain apple orchards in western Illinois during the past five years, are described [*R.A.E.*, A, ix, 164]. The larvae hatch when the fruit buds separate in the spring,

and feed in a web over the buds. As soon as the young apples have set, they eat out cavities in the sides of the fruit. The control experiments described in this paper have already been noticed [*R.A.E.*, A, xiv, 260].

HAWLEY (I. M.). **The Fruit Tree Leaf Roller and its Control by Oil Sprays.**—*Utah Agric. Expt. Sta.*, Bull. 196, 13 pp., 9 figs., 4 refs. Logan, Utah, June 1926. [Recd. April 1927.]

The life-cycle and seasonal history of *Tortrix (Archips) argyrospila*, Wlk., is described as occurring in Utah, where it has been very destructive for the last few years in at least five counties, though in none of them has the infestation been general. The commonest food-plants are apple, cherry, pear, plum, quince and apricot. The two possible methods of controlling the pest are a strong lead arsenate spray (6 lb. to 100 U.S. gals. water) against the larvae, which occur in May and June, and a dormant oil spray against the eggs. The latter is by far the more successful method and has been developed during recent years [*R.A.E.*, A, xiii, 500 ; xiv, 260, etc.]. The results of numerous experiments with various miscible oils and oil emulsions are given. As emulsifiers potash fish-oil soap and casein-lime (cold-mix) appeared equally satisfactory. It is recommended that an 8 per cent. miscible oil or a 6 to 8 per cent. lubricating oil emulsion, the oil for which should have a viscosity of approximately 90–250 seconds (Saybolt) at 100° F., volatility not over 2 per cent., and specific gravity 0.87 to 0.93 at 68° F., should be applied in the spring before the buds burst, all parts of the tree to be thoroughly sprayed until they begin to drip.

STEWART (G.) & BATEMAN (A. H.). **Field Studies of Sugar-Beet Nematode.**—*Utah Agric. Expt. Sta.*, Bull. 195, 32 pp., 9 figs. Logan, Utah, May 1926. [Recd. April 1927.]

The information on the life-history of *Heterodera schachtii*, Schmidt (sugar-beet Nematode) given in this bulletin has already been noticed [*R.A.E.*, A, viii, 414 ; x, 404]. In a survey of this pest carried out in Utah many agricultural measures known to increase the yield of sugar-beets (either directly or indirectly), such as various methods of cultivation, manuring and irrigation, were all observed with regard to their effect on the yield of beets on land infested with the Nematode. Where the infestation was light, each of these practices was found to produce an increase that might be considered significant, but on severely infested land none had any beneficial action except crop rotation, and this had an almost immediate effect. After one year of an alternate crop there was little increase, but the increase was greater for each year elapsing between two beet crops, until the yield after four years of other crops was approximately equal to that obtained from uninfested land. After the fourth year there was no further increase in yield as a result of a longer period between crops, owing to the persistence of a certain number of Nematodes on weeds [*cf. R.A.E.*, A, xi, 380]. After four years of other crops there were not enough Nematodes present in the soil to prevent a good yield, but they multiplied so rapidly after feeding on sugar-beets again that they lowered considerably the yield of beet if planted a second year in succession. Various crop rotations are suggested. On infested land two sugar-beet crops in an eight or ten year rotation is as much as can be expected.

BURGESS (A. F.). **Federal Gypsy Moth Work in Massachusetts.**—*Ann. Rept. Commiss. Conserv. & State Forester Mass., 1926*, Publ. Document no. 73, pp. 27–28. [Boston, Mass., 1927.]

A material decrease in infestation by *Porthetria dispar*, L., resulted in 1925–26 in the barrier zone in Massachusetts from the measures taken in the previous year. The work of inspecting products likely to carry the moth outside the quarantined area has greatly increased. Parasites were successfully imported during the summer of 1925 from various countries in Europe, but further work will be done on the bionomics of certain species that are extremely difficult to ship or colonise. If the parasites of *P. dispar*, which at present show a tendency to decrease, do not become more abundant, serious damage may result from an increased infestation of the moth indicated by the number of egg-clusters found in the autumn of 1926. Parasitism of the brown-tail moth [*Nygmia phaeorrhoea*, Don.] has also been somewhat reduced, and the insect was more abundant in 1926 than in the previous year, so that unless effective control measures are taken severe defoliation is likely to result in 1927.

**Entomology.**—*Texas Agric. Expt. Sta., 39th Ann. Rept., 1926*, pp. 28–31. College Station, Texas, 1927.

Continuing the previous studies on *Aphis gossypii*, Glov., on cotton [R.A.E., A, xiv, 275] 54 generations were reared during the year, of which 3 per cent. were winged forms; these occurred in only 6 of the generations and in each case crowding had taken place. Isolations were made from 8 different generations, and the individuals developing in each were allowed to become crowded; in every case winged forms appeared, whether the temperature was high or low, as long as it was sufficiently high to permit reproduction. Winged or wingless forms can, in fact, be produced at will by permitting or preventing a crowded condition.

In order to study the ingestion of poison by the cotton boll weevil [*Anthonomus grandis*, Boh.] field applications of calcium arsenate dust were made to cotton in the morning when a heavy dew was present, using 10 lb. an acre. Analysis of the dusted buds and of 430 boll weevils killed by the poison showed that it would be necessary for a weevil to devour all the poison present on a bud or equivalent surface in order to obtain a fatal dose. The indications are that weevils obtain the greater part of the poison that kills them by the adherence of small particles of dust as they travel over the plant, and that 60 per cent. of them die from poison so obtained. The degree of mortality of weevils on hairy varieties of cotton is therefore to be compared experimentally with that obtained under similar conditions upon less hairy ones.

As a test of the efficacy of aeroplane dusting for *A. grandis*, 11,200 lb. of calcium arsenate were distributed in three applications at an average rate of a little more than 9½ lb. an acre for each application. The yields are not yet complete, but the indications are that the poison was effective in reducing damage by the boll weevil.

Some of the eggs of the cotton flea-hopper [*Psallus seriatus*, Reut.] laid on or before 1st September are able to survive the high temperatures of that month and remain dormant on the weeds until spring, the number of eggs passing the winter in this way sometimes being remarkably high. The eggs hatch in maximum numbers on 6th April.

Destruction of the weed food-plants in early autumn is essential if infestation in the following spring is to be prevented. In the heavy spring infestation of 1926 many dusts and sprays were tested; sulphurs again proved superior to all combinations not containing sulphur. A dust containing sulphur, naphthalene and lime, and another containing sulphur and tobacco were especially promising.

Calcium cyanide dusts proved fairly effective against ants on *Citrus*, but were not entirely satisfactory; dusting must be repeated at short intervals to hold the pest in check.

GORHAM (R. P.). **Wheat Insects in New Brunswick a Century Ago.**—*Sci. Agric.*, vii, no. 8, pp. 287–289. Ottawa, Ont., April 1927.

This paper discusses the occurrence in New Brunswick in the early part of the 19th century of the two wheat pests, *Mayetiola* (*Phytophaga*) *destructor*, Say (Hessian fly) and *Sitodiplosis* (*Thecodiplosis*) *mosellana*, Géh. (wheat midge). *M. destructor* was a recognised pest of wheat as early as 1792, but the injury due to it diminished later, and it is not officially reported as a pest after 1810. One cause of its disappearance may have been the change in agricultural practice from autumn to spring sowing of wheat. The tradition also exists that because of insect injury long ago wheat growing was abandoned and buckwheat planted in its stead. *S. mosellana* seems to have appeared in New Brunswick about 1841–42. In 1844 there was a severe outbreak in one locality, and in 1847 the sowing of wheat was to a great extent discontinued; oats, which were generally substituted, were not damaged to any great extent. In another locality where the wheat crops had been good the insect did not make its appearance until 1847. In 1849 it had practically disappeared, probably owing to the severe winter.

HERMAN (F. A.) & KELSALL (A.). **The Determination of Arsenical Residues on Apple Foliage.**—*Sci. Agric.*, vii, no. 8, pp. 290–291. Ottawa, Ont., April 1927.

In 1926, when tests were being made of the relative persistence of arsenic on apples at various stages of maturity, it was decided to conduct a parallel experiment with apple leaves. In general the results indicate that in combination with lime-sulphur lead arsenate powder adheres better than lead arsenate paste, and the latter better than calcium arsenate. These arsenates combined with aluminium sulphate and lime-sulphur adhere better than when they are combined with lime-sulphur alone. The adhesive properties of calcium arsenate in the aluminium sulphate and lime-sulphur mixture are almost equal to those of lead arsenate powder and superior to those of lead arsenate paste. In Bordeaux mixtures the adhesion of calcium arsenate is greater than that of any of the arsenates combined with lime-sulphur. Weather conditions are of importance when determining the persistence of arsenic on apples and apple foliage; these experiments were carried out during a period with very little rainfall.

KELSALL (A.) & HOCKEY (J. F.). **Nova Scotia Apple Spray and Dust Calendars, 1927.**—*Canada Dept. Agric.*, Pamphlet, N.S. no. 78, 7 pp. Ottawa, Ont., February 1927.

This information is substantially the same as in the calendars for 1926 [*R.A.E.*, A, xiv, 494].

MOREIRA (C.). "**O vermelho**" *Cerococcus parahybensis* Hempel, **parasita do cafeeiro no Estado da Parahyba**. [*C. parahybensis* infesting Coffee in the State of Parahyba.]-*Chacaras e Quintaes*, xxxv, no. 3, pp. 225-226. S. Paulo, 15th March 1927.

The information given here is the same as that in a paper already noticed [*R.A.E.*, A, x, 205].

DE AZEVEDO MARQUES (L. A.). **Pragas do Algodoeiro. III.** [Cotton Pests. III.]-*Bol. Minist. Agric. Ind. e Comm.*, xvi (i), no. 1, pp. 59-65, 3 figs. Rio de Janeiro, January 1927.

This article describes the standard methods, particularly the use of Paris green as a dust, against *Alabama argillacea*, Hb., which infests cotton in Brazil [*cf. R.A.E.*, A, ii, 694, etc.].

COPELLO (A.). **Biología de *Hermetia illucens*, L. (La mosca de nuestras colmenas)**. [Biology of *H. illucens*, the Fly of Argentine Bee-hives.]-*Rev. Soc. ent. argent.*, i, no. 2, pp. 23-26, 1 fig., 1 pl. Buenos Aires, 31st December 1926. [Recd. April 1927.]

The adults of the Stratiomyiid, *Hermetia illucens*, L., are active from the middle of spring to the end of summer in Argentina and lay their eggs on decomposing organic matter, or in the cracks in the fronts of bee-hives. The larvae hatch in 4-6 days. In the hives they feed on pollen honey, and those that survive the attacks of the bees pass through a pupal stage of 2-20 days. If the bee-colony is a weak one, these larvae may be able to destroy it.

[AUSTRALIA.] **Quarantine Regulations 1927**.—*Statutory Rules*, 1927, no. 8, 63 pp. Melbourne, 25th January 1927.

These regulations repeal a large number of former ones, and include all details as regards the quarantine of persons, animals, plants, etc., coming into Australia, with methods of disinfection and treatment.

BRUES (C. T.). **Some South African Parasitic Hymenoptera of the Families Evaniidae, Braconidae, Alysiidae and Plumariidae in the South African Museum with a Catalogue of the known Species**.—*Ann. S. Afr. Mus.*, xix, pt. 1, pp. 1-150. Cape Town, March 1924. **Studies on Ethiopian Braconidae, with a Catalogue of the African Species**.—*Proc. Amer. Acad. Arts & Sci.*, lxi, no. 8, pp. 205-436, 2 pls., 9 pp. refs. Boston, Mass., July 1926. [Recd. April 1927.]

The first of these papers contains descriptions of many new species as well as numerous keys. Practically all are from the part of the continent south of the Zambezi and Kunene Rivers. In the second paper, species from additional collections from various parts of South and East Africa and the Belgian Congo are recorded, with descriptions of a number of new ones. The catalogue of African Braconids includes those from North Africa and from Madagascar.

EDWARDS (W. H.). **Ce qu'il importe de connaître sur les méthodes de destruction employées contre les insectes nuisibles.**—*Rev. agric. Ile Maurice*, nos. 21–24, pp. 480–482, 517–520, 572–574, 622–624 ; & no. 26, pp. 64–65. Mauritius, 1925–1926. [Recd. April 1927.]

This is a general account of the remedial measures employed in Mauritius for the control of insect pests ; they include mechanical measures, such as the collection of the various stages, the use of insecticides and cultural measures. The value of natural enemies is also briefly dealt with.

D'EMMEREZ DE CHARMOY (D.). **Nouveau moyen pour combattre la fourmi rouge.**—*Rev. agric. Ile Maurice*, no. 28, pp. 176–177. Mauritius, July–August 1926. [Recd. April 1927.]

Red ants may be effectively prevented from attacking young seedlings by scattering paradichlorobenzene round each plant ; it should be lightly covered with earth and not allowed to come in contact with the plant. Other substances, such as kerosene, creoline or carbolic acid, may be used in the same way by mixing them with sawdust.

To protect freshly sown seed from the attack of these ants a mixture of ground bran of wheat and maize, in equal parts, should be broadcast immediately after sowing. The ants will feed on this and carry it to their nests, thus allowing the seed to develop normally.

D'EMMEREZ DE CHARMOY (D.). **L'utilisation du chloryl (paradichlorobenzène) dans la lutte contre les insectes nuisibles.**—*Rev. agric. Ile Maurice*, no. 29, pp. 224–228. Mauritius, September–October 1926. [Recd. April 1927.]

This is a short general account of the uses of paradichlorobenzene in the control of insect pests. Experiments with this material against the larvae of *Oryctes* and *Lachnosterna* (*Phytalus*) have not given very promising results in Mauritius, but no definite conclusions can be drawn as yet with regard to its value under local conditions of agriculture.

VAN DER MEER MOHR (J. C.). **Overzicht van de dierlijke vijanden van de kapokcultuur op Java.** [Survey of the Animal Pests of Kapok Cultivation in Java.]—*Inst. Plantenziekten*, Bull. 21, 22 pp., 9 pls. Buitenzorg [1927 ?].

Little is known of the diseases and pests of kapok [*Eriodendron anfractuosum*] in the Dutch East Indies, and some of those here recorded may only occur accidentally on this tree.

Orthoptera include *Oxva velox*, F., *Atractomorpha crenulata*, F., *Catantops splendens*, Thunb., *Phaneroptera gracilis*, Burm., and *Brachytrypes portentosus*, Licht., which are particularly injurious to seedlings.

The termite, *Coptotermes gestroi*, Wasm., attacks both healthy and dying trees, while *Termes gilvus*, Hag., destroys the pods that have fallen on the ground and the newly sown seed.

Coleopterous pests include *Batocera hector*, Dej., which is perhaps the most dangerous stem-borer of kapok ; *Alcides leeuweni*, Hell., the larva of which bores the pods, and the adult the ends of the twigs ; *Nisotra javana*, Mot., which attacks the leaf-blades and leaf-stems, causing

considerable injury; *Chrysochroa bicolor*, F.; *Monochamus* (*Monohammus*) *fistulator*, Germ.; *Glenea novemguttata*, Cast.; *Hypomeces squamosus*, F.; *Apoderus* sp.; *Araecerus fasciculatus*, DeG.; *Adoretus compressus*, Web.; *Dactylispa leonardi*, Rits.; and *Collyris emarginata*, Dej.

A leaf-cutting bee, *Megachile* sp., sometimes causes damage to the seedlings.

The larvae of the Noctuid, *Mudaria variabilis*, Rpke., feed on the lint in the pods and also give rise to fungus infections, so that a loss of 40–50 per cent. may result. Other Lepidoptera include a Pyralid, *Dichocrocis punctiferalis*, Gn.; the Psychids, *Pagodia hekmeyeri*, Heyl., *Pteroma reijnvaani*, Heyl., and *Clania variegata*, Sn.; *Zeuzera coffeae*, Nietn.; *Arbela tetraonis*, Mo.; the Limacodids, *Belippa laleana*, Mo., and *Orthocraspeda sordida*, Sn.; *Hyposidra* sp.; the Sphingid, *Marumba* (*Polyptychus*) *dyras*, Wlk.; a Lymantriid, *Dasychira* sp.; and a Noctuid, *Autoba lilacina*, Warr.

Rhynchota include *Dysdercus cingulatus*, F., which may prevent the development of the fruits though the injury recorded hitherto does not warrant remedial measures, *Tectocoris lineola*, F., var. *cyaniipes*, F., *Dalpada versicolor*, H.S., *Tetroda histeroides*, F., *Helopeltis antonii*, Sign., *H. theivora*, Waterh., *Ricania speculum*, Wlk., *Lawana candida*, F., and *Tettigoniella ferruginea*, F. The Aphid, *Aphis gossypii*, Glov., and the Coccids, *Icerya jacobsoni*, Green, *Pseudococcus crotonis*, Green, and *Saissetia* (*Lecanium*) *nigra*, Nietn., have been found on kapok, but are not serious pests.

MASON (P. W.). U.S. Bur. Ent. **Fauna sumatrensis.** (Beitrag no. 38.)

**Aphididae.** —*Supplementa ent.*, no. 15, pp. 86–90, 2 figs. Berlin, 15th April 1927.

Several of the Aphids in this paper are included in Takahashi's lists from Sumatra [*R.A.E.*, A, xiv, 326, 623], the following being additional: *Greenidea ficicola*, Tak., from several species of *Ficus*; *Aphis citricidus*, Kirk., from *Citrus*; *A. lutescens*, Monell, from *Asclepias curassavica*; *Macrosiphum sumatrensis*, sp. n., from cultivated roses; *Amphorophora* (*Megoura*) *jacobsoni*, sp. n., from *Gardenia florida* and *Cinnamomum burmanni*; *Myzus circumflexus*, Buckt., from cultivated dahlias; and *Cerataphis lataniae*, Boisd., from palms.

KUIJPER (J.). **Verslag [Report] van het Deli Proefstation over 1 Januari 1926–31 December 1926.**—*Meded. Deli Proefst.*, (2) no. xlv, 36 pp. Medan, Sumatra, 1927.

Excellent results against *Myzus persicae* on tobacco were obtained with derris sprays, the addition of nicotine to such solutions being found unnecessary. An account is given of tests of various commercial insecticides. The caterpillars of *Phytometra* (*Plusia*) *signata*, *Heliothis* (*Chloridea*) *assulta* and *Prodenia litura* were also troublesome on tobacco; in some localities *H. obsoleta* replaced *H. assulta*.

**Territory of New Guinea. The Plantation Diseases and Pests Ordinance.**—*Dept. Agric.*, Leaflet no. 54, 2 pp. Rabaul, 11th February 1927.

The attention of planters is drawn to those sections of the Plantation Diseases and Pests Ordinance, 1916, that deal with the reporting of the

presence of proclaimed pests and diseases of coconut, and their control. The insects concerned are:—*Brontispa froggatti*, *Promecotheca opacicollis*, *P. antiqua*, *Aspidiotus destructor*, *Aleurodicus cocois*, *Thosea cinereomarginata*, *Eurytrachelus pilosipes*, *Xylotrupes* spp., *Trichogomphus* spp., *Oryctes* spp., *Scapanes* spp., *Rhynchophorus ferrugineus*, and grasshoppers, including *Habetia [defoliaria]* and other Orthoptera.

The import and export of seed coconuts, or nuts in the husk, into the Territory of New Guinea, or from one district of it to another, is only allowed with a permit from the Director of Agriculture. The introduction of any seeds or plants is only permitted through Ports of Entry and after inspection.

HASE (A.). **Ueber Temperaturversuche mit den Eiern der Mehlmotte** (*Ephestia kuehniella*, Zell.). [On Temperature Experiments with the Eggs of the Meal Moth, *E. kuehniella*.]—*Arb. biol. Reichsanst. Land- u. Forstw.*, xv, no. 2, pp. 109–133, 7 figs., 14 refs. Berlin, February 1927. [Recd. April 1927.]

Over 300,000 eggs of *Ephestia kuehniella*, Zell., were used in these extensive experiments. A cold chamber, specially designed by the author to maintain a constant low temperature, formed part of the equipment. Preliminary observations showed that at a constant temperature of 25–25.2° C. [77–77.36° F.] incubation required on an average 4½ to 5½ days. The minimum time is 3–4 days, the requisite temperature being 30.4 to 32.9° C. [86.72–91.22° F.]. Incubation is of the same duration for eggs laid 1–3 days after mating, but eggs laid later take longer to incubate. The main experiments fall into two groups. In the first, eggs were placed in a temperature of 3–5° C. [37.4–41° F.] immediately after oviposition and then brought into 25° C. [77° F.]. It was found that 12 per cent. of the eggs hatched after 30 days exposure to cold. If the cold period was prolonged over 30 days, none hatched. Regardless of the preceding number of cold days, the larvae hatched after 4–6 days of warmth. In the second group of experiments the eggs were exposed to intermittent cold periods, the cold and warm days being alternated in various ways. It was found that hatching might be delayed 21 days in the case of early-hatching larvae and 28 days for late-hatching larvae. The experiments of the first group represent the conditions present in a severe winter, while those of the second represent those in a mild winter.

WEBER (E.). **Das Massenaufreten der Rübenaskäfer im Deutschen Reich im Jahre 1925.** [The Outbreak of the Beet Silphid Beetle in Germany in 1925.]—*Arb. biol. Reichsanst. Land- u. Forstw.*, xv, no. 2, pp. 215–247, 8 figs., 26 refs. Berlin, February 1927. [Recd. April 1927.]

This record of the occurrence in 1925 in Germany of *Blitophaga opaca*, L., is a continuation of investigations already noticed [*R.A.E.*, A, xiii, 395]. The three regions mainly involved were the coast of Pomerania and Mecklenburg, the interior of Brandenburg and the interior of Silesia. The increase of *B. opaca* was due to the mild winter, spring and early summer. The increase in beet cultivation has led to the extension of the latter to light warm soils, which present conditions favourable to the pest. Woods and hills that afford protection against the cold east winds also form predisposing factors.

The following data were obtained in Pomerania. Captures showed that low temperature, storms, heavy dew, and drought decrease the numbers of hibernated adults, but this is merely due to the beetles having sought shelter. Cultural measures such as rolling and hoeing are now considered to effect a real decrease by destroying the beetle and its immature stages. Experimentally the adults fed on peas and beans. As regards infestation of beet by the larvae it was found that repeated and intensive hoeing directly decreased the infestation and promoted the growth of the plants. On the other hand, injury and infestation increased if the beet plants were thinned at the period of maximum infestation, because the insects took refuge under the plants lying about on the ground and then concentrated on those left standing.

The only other pest of importance was the beet-fly, *Pegomya hyoscyami*, Panz.

GOFFART (H.). **Versuche zur Bekämpfung der Rüben nematoden** (*Heterodera schachtii*, Schm.) **mit Calciumcyanid.** [Experiments with Calcium Cyanide against the Beet Nematode, *H. schachtii*.]—*Arb. biol. Reichsanst. Land- u. Forstw.*, xv, no. 2, pp. 249–259, 16 refs. Berlin, February 1927. [Recd. April 1927.]

Various experiments made with plants in pots and in the field show that calcium cyanide is far too costly (at least £300 an acre) for use against the beet Nematode, *Heterodera schachtii*, Schm.

[IL'IN (B. S.).] **Ильин (Б. С.). The Larva of *Callipogon relictus* Sem. (Coleoptera, Cerambycidae).** [In Russian.]—*Rev. russe Ent.*, xx, no. 3-4, pp. 204–209, 6 figs. Leningrad, 1926. [Recd. April 1927.]

The larva of *Callipogon relictus*, Sem., is described from *Quercus mongolica* in Ussuri (Eastern Siberia). In a foot-note by Semenov-Tyan-Shanskii it is stated that a slightly larger larva of this beetle has since been obtained from *Fraxinus* in Eastern Siberia. It has also been recorded from *Ulmus japonica* and probably attacks a number of other trees, but not conifers.

[FILIP'EV (I. N.).] **Филипьев (И. Н.). *Locusta migratoria*, L., in Western Europe.** [In Russian.]—*Rev. russe Ent.*, xx, no. 3-4, pp. 245–249, 1 map, 2 refs. Leningrad, 1926. (With a Summary in French.) [Recd. April 1927.]

On the basis of the data accumulated in the recent work on *Locusta migratoria*, L., by Nikol'skii [*R.A.E.*, A, xiii, 70] and Rudy [*R.A.E.*, A, xiii, 531], the author gives a short review of the distribution and outbreaks of this locust in Western Europe. He maintains that the principal breeding-place of *L. migratoria* used to be in Hungary and in the Ukraine, but that some secondary breeding-places developed from time to time in the countries to the west, where the mass breeding of locusts was possible only during abnormally hot and dry years. The disappearance of locusts from Western Europe during the last century is due to the activities of man, particularly to the regulation of rivers, which has destroyed the original breeding grounds.

MEYER (N. F.). **Einige neue Ichneumoniden und Cynipiden.** [Some New Ichneumonids and Cynipids.]—*Rev. russe Ent.*, xx, no. 3-4, pp. 260-264, 2 figs. Leningrad, 1926. [Recd. April 1927.]

The Ichneumonids described include :—*Angitia rapae*, sp. n., from larvae of *Pieris rapae*, L., in the Caucasus ; and *Banchus obscurus*, sp. n., from larvae of *Polia oleracea*, L., in Leningrad. The Cynipid *Cothonaspis (Idiomorpha) gerasimovi*, sp. n., was reared from *Phorbia (Chortophila) brassicae*, Bch., in Leningrad.

[FILIP'EV (N. N.).] ФИЛИП'ЕВ (Н. Н.). **Lepidopterologische Notizen.** IV.—*Rev. russe Ent.*, xx, no. 3-4, pp. 287-291, 7 figs., 1 ref. Leningrad, 1926. [Recd. April 1927.]

*Lithocolletis obliquifascia*, sp. n., and *L. populiella*, sp. n., from mines in poplar leaves, and *Coleophora hemerobiola*, sp. n. (food-plant not stated) are described from Turkestan.

[MIGULIN (A.) & KAZAS (I.).] МИГУЛИН (А.) и КАЗАС (И.). **Phylloxera in the Ukraine in 1926.** [In Russian.]—*Visnik Plodovodst. Vinogradarst. ta Gorodnitz.* [*Herald of Hort. & Vitic.*], 1926, no. 10, pp. 446-450, 1 map. Kharkov, October 1926. [Recd. April 1927.]

The distribution of *Phylloxera* in the Ukraine is discussed with a view to future quarantine measures.

[TULASHVILI (A.).] ТУЛАШВИЛИ (А.). **The Transcaucasian Cockchafer and its Control.** [In Russian.]—*Visnik Plodovodst. Vinogradarst. ta Gorodnitz.* [*Herald of Hort. & Vitic.*], 1926, no. 10, pp. 452-456, 2 refs. Kharkov, October 1926. [Recd. April 1927.]

This is an account of the life-history and control of *Polyphylla olivieri*, Lap., attacking vines in Georgia [*R.A.E.*, A, xv, 126]. The collection of the larvae [*loc. cit.*] is recommended as the most satisfactory measure. *Amphimallus solstitialis*, L., and *Melolontha pectoralis*, Germ., occurred in varying numbers with *P. olivieri* in the harder soils, but they were absent in soft, well cultivated soils.

[MOGILYANSKIĬ (N.).] МОГИЛЯНСКИЙ (Н.). **Clysia (Cochylis) ambigua, Hb., and Polychrosis botrana, Schiff.** [In Russian.]—*Visnik Plodovodst. Vinogradarst. ta Gorodnitz.* [*Herald of Hort. & Vitic.*], 1926, no. 3-4, pp. 114-124, 2 figs., 1 ref. Kharkov, March-April 1926. [Recd. April 1927.]

A general account is given of the bionomics of the vine-moths, *Clysia ambigua*, Hb., and *Polychrosis botrana*, Schiff., with a key to their various stages. Very little is known about their distribution or the conditions essential for their development in Russia. The various remedial measures, such as biological control, mechanical and cultural measures, and the use of insecticides, as recommended in other countries, are discussed. The sprays dealt with include a number of proprietary brands containing arsenicals or tobacco extract. The different types of suitable apparatus are also described.

[ZNAMENSKIĬ (A. V.).] Знаменский (А. В.). **Instructions for Carrying out Observations on the Entomofauna of the Soil.** [In Russian.]—Trudui Poltavsk. S.-Kh. Opuitn. Stantz. [Trans. *Poltava Agric. Expt. Sta.*], no. 51, Ent. Div. no. xiv, 58 pp., 72 figs. Kiev, 1927.

These instructions for studying insect pests occurring in the soil include details of the methods to be employed in taking samples of infested soil and also for the subsequent preparation and conservation of the specimens. A number of keys are given for the identification of the various groups of soil-inhabiting insects.

[AVERIN (V. G.).] Аверин (В. Г.). **The Hop Aphis.** [In Russian.]—Tzentral. Stantz. Zakhist. Roslin [Central Plant Prot. Sta.], Bull. 1, 8 pp., numerous refs. Kharkov, 1927.

This is a short account of the bionomics and control of *Phorodon humuli*, Schr., as a pest of hops, compiled from existing literature.

[RODIONOV (Z. S.).] Родионов (З. С.). **What are the Pests of Cotton and how can they be controlled.** [In Russian.]—21 pp., 11 figs. Baku, Narkomzem Ozra, 1927.

This is a popular account of cotton pests in Transcaucasia. They are dealt with under their popular names and arranged according to the type of injury.

HUKKINEN (Y.). **Tiedonantoja viljelyskasveille vahingollisten eläinlajien esiintymisestä Pohjois-Suomessa.** [Communications on the Pests of Cultivated Plants in North Finland.]—*Maatalouskoelaitos (Lantbruksförsöksanstalten)*, Tieteellisiä julkaisuja no. 25, 164 pp., 15 maps, 187 refs. Helsingfors, 1925. (With a Summary in German.) [Recd. April 1927.]

This paper gathers together the existing scattered information on the pests of cultivated plants in northern Finland. The insects are dealt with under their natural orders, and the following species not mentioned in recent papers [*R.A.E.*, A, xv, 272, 273] are some of the principal pests.

*Limothrips denticornis*, Hal., causes white-ear in barley, while *Aptinothrips rufus*, Gmel., probably does so in meadow grasses.

The Capsids, *Lygus pratensis*, L., *L. campestris*, L., and, to a less degree, *L. pabulinus*, L., are pests of vegetables. The Aphids, *Macrosiphum granarium*, Kby., and *Aphis (Siphonaphis) padi*, L., attack cereals, and *Capitophorus (Myzus) ribis*, L., currants.

The Silphid, *Blitophaga opaca*, L., is perhaps the most important pest of cultivated plants, beet, barley, crucifers, potatoes and spinach being those chiefly affected. Its abundance is ascribed to the many weeds found in fields where there has been a continued cultivation of spring-sown plants, especially barley. The Elaterid, *Corymbites cupreus aeruginosus*, F., also does much harm to barley. Crucifers are attacked by the Nitidulid, *Meligethes aeneus*, F., the Halcids, *Phyllotreta undulata*, Kutsch., and *P. flexuosa*, Illig., and the weevil, *Otiorrhynchus dubius*, Ström. Other harmful Coleoptera include *Byturus tomentosus*, F., on raspberry; *Galeruca tanaceti*, L., on meadow grass; and *Hypera (Phytonomus) rumicis*, L., and *Rhinoncus pericarpus*, L., on rhubarb.

Lepidopterous pests include *Cyaniris argiolus*, L., on black currants ; *Zophodia convolutella*, Hb., and *Thamnonoma wavaria*, L., on red currants ; *Crambus* spp., which do considerable harm to meadows ; *Cydia* (*Laspeyresia*) *nigricana*, Steph., which is a common pest of peas ; *Plutella maculipennis*, Curt., *P. annulatella*, Curt., *Pieris brassicae*, L., and *P. napi*, L., on crucifers ; and *Hepialus fusconebulosus*, DeG., on potatoes.

*Tipula oleracea*, L., and other Tipulids are very harmful to various plants. *Hylemyia antiqua*, Mg., and *Eumerus strigatus*, Fall., are serious pests of onions. *Psila rosae*, F., attacks carrots, *Hydrellia griseola*, Fall., barley, and *Pegomyia hyoscyami*, Panz., beet.

Injurious sawflies include *Emphytus* (*Allantus*) *truncatus*, Kl., on strawberries ; *Pteron* (*Pteronidea*) *ribesii*, Scop., and *Pristiphora pallipes*, Lep., on currants ; and *Pachynematus pumilio*, Knw., on black currants.

Mites include *Tetranychus* sp. on potatoes and the currant mite, *Eriophyes ribis*, Nal. The Nematode, *Tylenchus hordei*, Schöyen, infests barley where this crop has been sown continuously.

BLATTNÝ (C.). **Nomenclature of Pests and Diseases of Hops.** [*In Czech.*]—*Ochrana Rostlin*, vi, no. 5-6, pp. 134-138. Prague, October-December 1926. [Recd. April 1927.]

This is a list giving the scientific and popular names of some 100 insect pests and diseases of hops in Czechoslovakia and of a few beneficial insects.

SZULCZEWSKI (J. W.). **Contribution to the Coccid Fauna of Posen.** [*In Polish.*]—*Polskie Pismo ent.*, v (1926), no. 3-4, pp. 137-143. Lemberg, 1927. (With a Summary in German.)

This is an annotated list of 36 Coccids observed in Posen (Poland).

FEYTAUD (J.). **La défense contre la bruche des haricots** (*Acanthoscelides obtectus*, Say).—*Rev. Zool. agric. & appl.*, xxv, no. 12, pp. 177-188, 26 refs. Bordeaux, December 1926. [Recd. April 1927.]

*Bruchus* (*Acanthoscelides*) *obtectus*, Say, which infests both field and stored beans in France, has been spreading since the War and is of sufficient importance to necessitate thorough and co-operative control measures. The usual methods of dealing with it, both in the field and in storage, are briefly reviewed.

BERRO AGUILERA (J. M.). **El gusano de las frutas** *Ceratitis capitata*, Wied. [The Fruit Maggot, *C. capitata*.—*Estac. Pat. veg. Almería*, Divulgación, 89 pp., 15 figs. Almería, 1927.]

An account is given of the bionomics and control of *Ceratitis capitata*, Wied., with descriptions of all the stages and notes on the fruits attacked. Measures against this fruit-fly should be organised and made compulsory in Almería. All infested fruits should be collected and buried. When the fruits begin to form, poison-baits consisting of sweetened sodium arsenite solutions sprayed on the trees in the Berlese method, or on bundles of twigs in the Lotrionte method, are advocated.

Newman's system of bait-traps [*R.A.E.*, A, xii, 411] was found unsatisfactory; it is pointed out that this author has subsequently advised a bait-spray [A, xiv, 204]. When an infestation has been ascertained, the ground beneath the trees should be watered every week with a 2 per cent. solution of potassium sulphocarbonate in order to kill the pupae. It is suggested that a study of the parasites of *Ceratitis* and *Dacus* should be made in West Africa, with a view to their introduction into Spain.

AYOUTANTIS (A.). **Introduction of *Icerya purchasi* into Athens.**—*Internat. Bull. Plant Prot.*, i, no. 2, pp. 19–20. Rome, March 1927.

Towards the end of 1926 *Icerya purchasi*, Mask., was introduced into Athens on ornamental plants from the French Riviera. Arrangements are being made to import the Coccinellid, *Novius [cardinalis]*, Muls., which is predacious on it.

RAMBOUSEK (F.). **Die Rübenschädlinge im Jahre 1926.** [Beet Pests in 1926.]—*Zeitschr. Zuckerind. tschl. Repub.*, li (viii), nos. 30–31, pp. 313–323, 325–335, 14 figs. Prague, 1927. (With a Summary in French.)

The beet pests recorded in Czechoslovakia in 1926 are dealt with in order of their importance. Baits of carrot placed before sowing may be used to reveal the intensity of wireworm infestation, and ground can also be cleared by means of baits of beets, potatoes, or carrots, which should be spaced at distances of about 5 yards and can afterwards be given to pigs. Manuring with saltpetre, kainit, etc., will kill many larvae and drive away others. It is important that the beet plants should be thinned as late as possible, because otherwise those that are left standing attract all the pests. The collection of the adult Elaterids on carrot plants sown for the purpose is one of the best measures. The beet-fly, *Pegomyia hyoscyami* var. *betae*, Curtis, caused serious losses. A bait-spray [*R.A.E.*, A, xiv, 376] should be applied about a week before thinning to each fifth row of plants. It is most important that no plants be left lying on the ground after thinning. *Aphis fabae*, Scop., which is considered distinct from *A. rumicis*, L., was common. This Aphid oviposits in autumn on *Euonymus*, from which it migrates after the leaves of the spring shoots lose their freshness, although able to remain on *Euonymus* until autumn. It is suggested that it might be checked by planting *Euonymus* and cutting off in spring the young branches covered with eggs. Silphid beetles (*Blitophaga undata*, Müll., and *Silpha obscura*, L.) were very injurious. Both larvae and adults should be captured under boards and other shelters before the beets are thinned. Baits are useless. The weevils, *Bothynoderes punctiventris*, Germ., *Otiorrhynchus ligustici*, L., *O. orbicularis*, Hbst., and *Tanymecus palliatus*, F., were kept down by spraying with barium chloride; a new Dipterous parasite of *B. punctiventris*, *Thereva plebeja*, L., has been observed. In 1926 *Atomaria linearis*, Steph., did little harm. The flea-beetle, *Chaetocnema tibialis*, Illig., caused damage to the leaves. The larvae of the Noctuid, *Euxoa (Agrotis) segetum*, Schiff., are largely checked by *Carabus cancellatus*, L., and they are parasitised by Hymenoptera and by the Tachinids, *Peleteria nigricornis*, Mg., *Phryxe vulgaris*, Fall., *Pales pavidus*, Mg., *Gonia capitata*, DeG., *G. divisa*, Mg., *Cnephala bucephala*, Mg., and *Bucentes cristata*, F.

Other pests include *Phytometra* (*Plusia*) *gamma*, L., *Arctia caca*, L., Tipulids, *Bibio hortulanus*, L., the sawfly, *Athalia colibri*, Christ, *Cassida nebulosa*, L., *Gryllotalpa gryllotalpa*, L. (*vulgaris*, Latr.), millipedes, and the Nematode, *Heterodera schachtii*, Schmidt. It was found that too great moisture is even more harmful to the last named than drought.

TRYON (H.). **Queensland Fruit Flies (Trypetidae), Series 1.**—*Proc. R. Soc. Queensland*, xxxviii, pp. 176–224, 5 pls. Brisbane, 1927.

This is a systematic account of the Queensland TRYPETIDAE, giving the external characters by which the various species may be distinguished from one another, together with a key to the species. The following species and varieties are described: *Dacus* (*Chaetodacus*) *tryoni*, Frogg. (Queensland fruit-fly); *D. (C.) tryoni* var. *musa*, n., from bananas (no description being given); *D. (C.) tryoni* var. *juglandis*, n., from walnut; *D. (C.) tryoni* var. *sarcocephali*, n., from *Sarcocephalus cordatus* and a single example from *Psidium*; *D. (C.) fagraea*, sp. n., from *Fagraea mülleri*; *D. (C.) halfordiae*, sp. n., from *Halfordia drupifera*; *D. (C.) aequalis*, Coq., from oranges; *D. (C.) bryoniae*, sp. n., from *Bryonia laciniata* and *Melothria cunninghamii*; *D. (C.) dorsalis*, Hendel (solanum fruit-fly) from *Solanum* spp. and occasionally *Capsicum* (the author considering this to be the species referred to by Howlett as *D. (Bactrocera) zonatus*, Saund. [*R.A.E.*, A, iv, 66]); *D. (C.) barringtoniae*, sp. n., from *Barringtonia calypttrata*; *D. (C.) musae*, sp. n., from bananas; *D. (C.) bancrofti*, sp. n., from *Cudrania javanensis*; *D. (C.) jarvisi*, sp. n., from *Careya australis* (cockatoo apple), pear and quince; *D. (Bactrocera) caudatus*, F., from *Bryonia laciniata*; *D. (B.) pulcher*, sp. n. (one adult observed on a fallen orange); *D. cucumis*, French (Queensland cucumber fly), from cucurbits and tomato; *D. signatifer*, sp. n., from *Capparis laurifolia*; *D. niger*, sp. n., from *Symplocos thwaitesii*; *Rioxa musae*, Froggatt, from several indigenous trees, *Citrus* and bananas; and *R. araucariae*, sp. n., and *R. jarvisi*, sp. n., of which the food-plants are unknown.

The synonymy, distribution and food-plants of the various species are discussed. The author considers *D. tryoni* to be a native species distinct from *D. (C.) ferrugineus*, F., and suggests that Bezzi did not have a typical example of *D. tryoni* before him when he made it a synonym, the specimen in his possession having been received from Gosford, N.S.W., and probably misidentified as *D. tryoni*, to which species all New South Wales fruit-flies were at one time referred. *Ceratitis capitata*, Wied. (Mediterranean fruit-fly) has not been observed by the author in Queensland, but is included in this account since it has been recorded from this State by others. The author considers that these records may be explained by the observation of adults that had escaped from infested fruit imported from New South Wales.

JOHNSTON (T. H.). **Remarks on the Propriety of Introducing Insects to control Prickly Pear in Australia.**—*Trans. & Proc. R. Soc. S. Aust.*, 1, pp. 235–240, 4 refs. Adelaide, December 1926. [Recd. April 1927.]

The author discusses the insects introduced to attack prickly-pear (*Opuntia* spp.) in Australia and points out the importance of ensuring that those imported into a country for purposes of biological control

will not become pests in that country. In the case in point, all the insects introduced into Australia are restricted to cactaceous plants and are most unlikely to become adapted to any other food-plant.

**TILLYARD (R. J.). Summary of the Present Position as regards Biological Control of Noxious Weeds.**—*N.Z. Jl. Agric.*, xxiv, no. 2, pp. 85–90. Wellington, N.Z., February 1927.

This is a report on a tour in America and Europe to obtain information on insects that might be introduced into New Zealand for the biological control of various noxious plants. The author considers that a very strong attack, which should be mainly directed towards the destruction of crowns and stems, could be developed against the blackberry by means of insects, subsidiary control being effected by the destruction of the leaves. This measure, however, carries with it a menace to raspberry, necessitating a single spring spraying with arsenic, and the cutting out of infested stems during winter pruning. In the author's opinion the Buprestid, *Coroebus rubi*, L., is the most promising insect for destroying blackberries, and he considers the fact that it occasionally attacks roses, which at present makes it ineligible for import permit, constitutes merely an infinitesimal menace. The larvae destroy up to 60 per cent. of new blackberry stems in Southern Europe in some years. The following insects attacking the crown and stem by boring or gall-forming have been accorded provisional permits: *Agrilus ruficollis*, F., *Pennisetia (Bembecia) marginata*, Harr., *P. (B.) hylaeiformis*, Lasp., and *Diastrophus rubi*, Htg., a small Cynipid that attacks the twigs. The large galls formed by *Lasioptera rubi*, Heeg., tend rather to stimulate than to check the growth of the plant. Insects useful for the auxiliary attack on leaves and shoots for which provisional permits have been issued include: *Thyatira batis*, L. (peach-blossom moth), *Notocelia uddmanniana*, L., and *Monophadnus (Monophadanoides) rubi*, Harr., which also feed on raspberry but can be easily controlled by an arsenical spray; *Tischeria marginata*, Haw., *Typhlocyba tenerrima*, H.S., and *Metallus rubi*, Forbes, which attack blackberry only; and *Schreckensteinia festaliella*, Hb. Two moths that require further testing before a permit can be issued for them are *Habrosyne derasa*, L., which rarely attacks raspberry, and *Cidaria albicillata*, L., which is recorded from raspberry, wild strawberry, alder and clematis as well as from blackberry. The weak spot in the attack is the absence of reliable species to destroy the flowers and young fruit. Various species of *Byturus* attack the fleshy receptacle of the fruit of species of *Rubus*, but appear to prefer raspberry to blackberry and do not prevent the formation of seed. The Anthomyiid, *Phorbia rubivora*, Coq., prefers raspberries, to which it is very injurious, to blackberries. The blackberry fruit-fly, *Pterandrus rubivorus*, Coq., found in South Africa, is stated never to attack raspberry or any other fruit, but should be subjected to very full tests before being introduced into New Zealand.

Gorse [*Ulex europaeus*] presents a special problem, as it is of value in supplying nitrogen to the soil and provides, when young, good fodder for sheep. It is therefore desirable to find an insect that would attack the seed and so prevent the spread of the plant without destroying it. A weevil, *Apion ulicis*, Forst., of which the larva feeds inside the green pods without previously destroying the blossom and apparently attacks no other leguminous plant, will, in the author's opinion, suffice for complete control in New Zealand.

Very little is known of the insects that attack St. John's wort [*Hypericum perforatum*], which is a potential pest in the North Island of New Zealand. *Chrysomela varians*, Schaller, and *C. hyperici*, Forst., attack the leaves both as larvae and adults, neither species being known to feed on anything else. The larvae of the Geometrids, *Anaitis plagiata*, L., and *A. efformata*, Guen., probably attack other plants as well. Several species of *Perrisia* form galls on the plant, especially *P. hyperici*, Bremi, and *P. serotina*, Winn. Tineid moths attacking the leaves and shoots include *Depressaria hypericella*, Hb., *Gracilaria auroguttella*, Steph., *Epinotia hypericana*, Hb., and *Aristotelia atrella*, Haw.

Provisional permits have been issued for the importation into New Zealand of *Tyria jacobaeae*, L., and *Homocosoma cretacella*, Rsl., the two chief insect enemies of ragwort [*Senecio jacobaeae*], a weed that is poisonous to cattle and horses and is spreading greatly. The larvae of *T. jacobaeae* often eat the plant completely to the ground, but the pupae appear to be subject to a severe fungous disease. This insect feeds also on groundsel, but *H. cretacella* is known only on ragwort. While the combination of these two species is expected to ensure adequate control, considerable difficulty is anticipated in acclimatising them in New Zealand. Careful tests will be carried out to determine whether they will damage any of the native species of *Senecio* or allied genera.

Few insects are known to feed on foxglove [*Digitalis purpurea*], a potential pest in hilly country. A small moth, *Eupithecia pulchellata*, Steph., attacks the flowers, the larva later boring into the seed capsule. A supply of hibernating larvae of *Melitaea athalia*, Rott., whose habitual food-plant is *Melampyrum*, has been shipped in cold storage to New Zealand, where an attempt will be made to rear a race that will normally feed on foxgloves. As *Melampyrum* is absent from New Zealand, the insect will die out if this attempt fails.

Every effort will be made to find a species of insect that will destroy a convolvulus (*Calystegia sepium*) that is likely to become a serious menace in the near future.

MUIR (F.) & SWEZEY (O. H.). **Entomology.**—*Rept. Comm. Expt. Sta. Hawaiian Sugar Pl. Assoc. 1924-25*, pp. 12 23. Honolulu [1926].

The sugar-cane leafhopper [*Perkinsiella saccharicida*, Kirk.] was exceptionally scarce, but enough eggs were found to determine that the percentage of parasitism by *Ootetrastichus* ranged from 0 to 75 and by *Paranagrus* from 1.6 to 27. The Chinese Dryinid parasite of the adults [*Pseudogonatopus hospes*, Perk.] was generally distributed, but not in sufficient numbers to be of much importance. *Cyrtorhinus mundulus*, Bredd., which preys on the eggs, was also generally distributed, but scarce owing to the scarcity of eggs. It appears to have been the most important factor in reducing the numbers of *Perkinsiella saccharicida*. Although it was found in a few instances in fields of maize, it was apparently not effective against the corn leafhopper [*Peregrinus maidis*, Ashm.], neither has it been found attacking the indigenous leafhoppers of the forest, even when *P. saccharicida* was exterminated. In one locality where the sugar-cane is annually affected by "eye spot" the leafhoppers appear to increase on the cane that is checked in growth, though the infestation in 1924-25 was not so severe or protracted owing apparently to the attacks of natural

enemies. In most plantations the cane-borer [*Rhabdocnemis obscura*, Boisd.] was satisfactorily controlled by the New Guinea Tachinid parasite [*Ceromasia sphenophori*, Vill.]. The investigation into the causes of the less satisfactory control of *R. obscura* by this fly in Hamakua was continued [R.A.E., A, xiii, 288], and it was found that it is practically as effective in this locality as elsewhere in Hawaii, the average parasitism for the season being 44.6 and 46.5 per cent. respectively. The extent of the damage done by the borer in spite of this is explained by the fact that the particular variety of cane grown is more susceptible to attack, and that much of the cane is broken by high winds, providing at the broken and split places below the accumulation of trash, a convenient place for infestation where the borer cannot be reached by the parasite. Short ratooning is recommended, as the flies can easily reach the borers in the young cane at the base of the newly forming stalk, while damage to older cane increases when it is much buried in trash or has been broken by the winds.

There have been outbreaks of army-worms at various times throughout the year, some of them much later than usual. In the grass-lands at higher elevations they probably breed throughout the year, and the moths migrate to the cane-fields when conditions are favourable. The Chalcid parasite, *Euplectrus platyhypenae*, How., has been reported from various localities and is probably established all over Hawaii. The Mexican Tachinid, *Archytas [cirphis]*, Curran, has become widely dispersed in the island of Oahu, and attempts are being made to introduce it into Hawaii and Kauai. As this fly is very prolific, it should prove of great value against army-worms and cutworms.

*Lysiphlebus testaceipes*, Cress., which was introduced in 1923, was found parasitising the corn aphid [*Aphis maidis*, Fitch] in various localities in 1925, showing that this Braconid is now well established in Oahu. It was also found attacking an Aphid on a weed (*Portulaca oleracea*). Attempts are being made to establish it in the other islands. *Aphelinus maidis*, Timb., a parasite of *Aphis maidis* and *A. sacchari*, Zehnt., was more abundant than in previous years. Outbreaks of *A. sacchari* were usually controlled by the attacks of Coccinellids and other predators, the most important being *Coclophora inaequalis*, F. Attempts are being made to establish another Coccinellid, *Leis* sp., from California.

*Heterodera radicolica*, Greeff, causes severe injury to pineapples and vegetable crops, and occasionally infests small areas of sugar-cane. *Tylenchus similis*, Cobb (*biformis*, Cobb) [R.A.E., A, iii, 726] has been found in Hawaii on various occasions living in the roots of sugar-cane and destroying both the cortex and the stele. It was found in large numbers in the corms of nut-grass (*Cyperus*) and observations indicate that this may be the chief breeding ground of this Nematode in the field. A species of *Xiphenema* was also found in the living tissues of sugar-cane. Three species of the genus *Mononchus* have been described from among the roots of sugar-cane in Hawaii, and it has since been discovered that they are predacious on other Nematodes. Some of them obtained access to a culture of *Cephalobus*, which they destroyed in a very short time. It has been suggested that more species of this and allied genera might be introduced into Hawaii with advantage.

Sodium cyanide, 900 lb. an acre, was very effective as a fumigant against insects, etc., in soil in fallow ground, but its use is not recommended owing to the fact that it leaves a residue of free alkali in the

soil. Calcium cyanamide (containing 40 per cent. calcium cyanide), 3 tons an acre, gave excellent results in fallow land and in ratoon cane killed 96 per cent. of the insects. Its effectiveness was greatly reduced seven weeks after application. At this rate the fumigant did not injure cane planted at intervals beginning within one week of application, but at the rate of 5 tons an acre the leaf edges were scorched, though the plants outgrew the injury after about 4 months. Carbon bisulphide and paradichlorobenzene proved unsatisfactory, but potassium xanthate gave some promise. The most effective way of applying the fumigants to local soils is by broadcasting the material and turning it in thoroughly.

*Larva luzonensis*, Roh., a parasite of the mole-cricket [*Gryllotalpa africana*, P. de B.] received from the Philippine Islands, has been liberated. A small weevil and the larva of a moth, both borers of nut-grass in the Philippines have also been liberated; the moth larva has since been found in nut-grass stems, indicating that it is becoming established.

MUIR (F.) & SWEZEY (O. H.). **Entomology.**—*Rept. Comm. Expt. Sta. Hawaiian Sugar Pl. Assoc. 1925-26*, pp. 16-29. Honolulu [1927.]

No important outbreaks of the leafhopper [*Perkinsiella saccharicida*, Kirk.] occurred, but its parasites *Paranagrus* and *Ooetetrastichus* continued to maintain their existence in spite of the scarcity of eggs. *Cyrtorhinus mundulus*, Bredd.] was generally difficult to find, though in a few instances where the leafhoppers had increased the bugs became more numerous.

Parasitism of the cane borer [*Rhabdocnemis obscura*, Boisd.] by the New Guinea Tachinid [*Ceromasia sphenophori*, Vill.] ranged from 11-100 per cent. with an average of 60 per cent. In general the control exercised by this parasite has been satisfactory, though considerable damage occurred in several places where conditions were not favourable for it to gain access to cane infested by the borer.

Outbreaks of army-worms, which occurred chiefly on the Island of Hawaii, were due to a great extent to adjacent grass areas where the army-worms breed continuously. The moths then migrate to fields of young cane, where grass is also present, to lay their eggs. Some of the larvae are always parasitised, though apparently the several kinds of parasites do not exercise sufficient control. The Chalcid, *Euplectrus platyhypenae*, How., is now known to be established in all the sugar plantation regions of Hawaii. The Mexican Tachinid, *Archytas cirphis*, Curran, has now been recovered at Hilo in Hawaii, where it had been introduced from Oahu, and has also spread to various regions on other islands. The small maggots of this fly (of which each female produces several hundred) are deposited on the leaves of plants and transfer themselves to caterpillars that come in contact with them while feeding. The Ichneumonid, *Hyposoter exiguae*, Vier., which was accidentally introduced into Oahu from California in 1925, has been naturally and artificially introduced into other islands, and as it has spread very rapidly, it promises to become a valuable parasite of army-worms. It attacks several other kinds of Lepidopterous larvae and in several places was found to produce a high percentage of parasitism. In one locality army-worms were attacked by a disease. Bacterial cultures were made and a large number were killed by experimental infection, to which they usually succumbed in 2-5 days. It is probable

that this disease is more effective than parasites in controlling army-worms, but no doubt requires special climatic conditions.

*Oxya velox*, F., has recently damaged sugar-cane to a considerable extent. The eggs are laid in the ground in masses of about 20, usually in regions covered with nut-grass [*Cyperus*], as this is a favourite food of the young grasshoppers. The eggs hatch in about 6 weeks, the young reach maturity in 6–10 weeks, and the adults live for 8–12 weeks, giving a total life-cycle of 20–28 weeks. Three to five generations may occur in a year.

For the first time in several years an outbreak of the sugar-cane leaf-roller [*Nacoleia accepta*, Butl.] occurred. The field was in close proximity to grass-lands where *N. accepta* breeds continuously, and 77·8 per cent. of the canes were injured. More than 63 per cent. of the larvae were parasitised, indicating that the moth would be controlled by natural means.

A large area of forests of koa [*Acacia koa*] on Maui was defoliated early in the year by the larvae of a native moth, *Scotorythra paludicola*, Butl. No instance of the kind has occurred in the last 30 years, and it caused some alarm as this area is part of the watershed supplying the large irrigation ditches. Seven months later the trees had made new growth, but there had been considerable dying back of terminal twigs and some of the trees may yet succumb. The most probable explanation of the outbreak is that the prolonged period of dry weather was unfavourable to the fungous diseases that in the normal wet weather kill a large proportion of the caterpillars.

*Larva luzonensis*, Roh., a parasite of the mole-cricket [*Gryllotalpa africana*, P. de B.] seems to be well established in two of the localities in which it was liberated in 1925. The nut-grass moth borer mentioned in the preceding report has become established. Since it made no noticeable reduction of the nut-grass in the areas where it was most abundant, its ultimate value is doubtful.

Experiments carried out to obtain information relative to the transmission of mosaic disease by the corn aphid [*Aphis maidis*, Fitch] indicated that it is not so active in this respect as was formerly supposed. When *A. maidis* was transferred from infected grasses to various kinds of grasses in cages, the disease was only transmitted in 7 cases out of 95; and of 65 attempts to transmit mosaic from infected maize to seedling canes, only 7 were successful. Large numbers of Aphids were used in each experiment. The sugar-cane leaf-mite [*Tetranychus exsiccator*, Zehnt.] used in several experiments, failed to transmit the disease. The corn leafhopper [*Peregrinus maidis*, Ashm.] also failed to transmit mosaic from maize to maize or from maize to sugar-cane.

The most abundant insects found in the soil are minute Collembola (possibly *Isotoma* spp.), but it is probable that they normally feed on decaying roots and only attack living cane in the absence of humus. Experiments in pots showed that the roots were severely pitted in two cases by these insects and there was a marked absence of secondary roots owing to mechanical damage, although neither of the plants showed any effects above ground. Similar experiments with *Mecistocephalus* were inconclusive, and in spite of field and laboratory evidence that these centipedes feed on sugar-cane, it seems improbable from their structure and the known habits of related species, that their preferred food is anything but animal life [cf. *R.A.E.*, A, xiii, 289]. Potassium xanthate was ineffective when applied to growing cane severely attacked by *Heterodera*.

Ten genera of Nematodes, represented by about 20 species, are now known in association with sugar-cane roots in the Hawaiian Islands. *Heterodera radicola*, Greeff (root knot nematode) and *H. schachtii*, Schmidt (beet nematode) are widely distributed in cane and pineapple fields and elsewhere; the latter appears to be the more destructive. Four species of *Tylenchus* are present in or around cane roots, of which *T. similis*, Cobb, is the most important. Some varieties of sugar-cane withstand Nematode attack better than others. Field observations and experiments demonstrate that when Nematodes are present in sufficient numbers the cane succumbs, while smaller numbers retard the growth considerably.

TAKAHASHI (N.). **Studies on *Pseudococcus comstocki*, Kuw.** [In Japanese.]—*Niigata Agric. Expt. Sta.*, Rept. 23, pp. 1–52, 3 pls. Niigata, Japan, April 1927.

The mealybug, *Pseudococcus comstocki*, Kuw., has done considerable damage to pears in recent years in the region of Niigata. It has three generations a year and usually passes the winter in the egg stage, though occasionally it hibernates as an adult or larva. The eggs begin to hatch in the middle of May, and the adults emerge 42–45 days later. The egg stage lasts 8–13 days in summer, and the hatching occupies 5–9 days. The females moult three times before reaching maturity, and begin to oviposit about 8–11 days after the last moult, laying an average of 362 eggs in 5 days. The eggs are destroyed by Cecidomyiid larvae. Spraying with nicotine sulphate and oil emulsion are recommended for control.

MARUTA (S.). **On *Rondotia menciana*, Moore, a new Pest of Mulberry.** [In Japanese.]—*Agric. Expt. Sta.*, Korea, Rept. no. 8, pp. 103–106. Suigen, Korea, April 1927.

*Rondotia menciana*, Moore, of which *R. lurida*, Fixsen, is thought to be a synonym, attacks mulberry in Korea and Japan. It has two generations a year, the moths emerging at the end of June and beginning of July and again at the end of August and beginning of September. The overwintering eggs are deposited on the bark of the trees and hatch at the end of May or the beginning of June, the larvae resting on the lower surface of the leaves, which they skeletonise in the earlier instars. Pupation occurs on the tree, the stage lasting 7–10 days, and the adults emerge about four weeks after the eggs hatch. Descriptions of each stage are given.

NISHIKAWA (H.). **Studies on *Antheraea pernyi*.** [In Japanese.]—*Seric. Expt. Sta. Korea*, Bull. 9, pp. 1–64. Suigen, Korea, February 1927.

The silk produced by *Antheraea pernyi*, Guér., is of considerable commercial importance in Korea and Manchuria. This moth has two generations a year, hibernating in the pupal stage. One female may lay 85–327 eggs, with an average of 192. The eggs hatch in 10–13 days at temperatures of 74–81° F. The larval stage lasts 34–47 days. Descriptions of each stage are given.

MATSUMURA (S.). **A new Injurious Dipterous Insect of Barley.**—*Insecta Matsumurana*, i, no. 3, p. 127. Sapporo, February 1927.

*Chlorops hordei*, sp. n., is described from barley in Sapporo, where the larva is very injurious, devouring the inner part of the stem.

OKAMOTO (H.) & TAKAHASHI (R.). **Some Aphididae from Corea.**—*Insecta Matsumurana*, i, no. 3, pp. 130-148. Sapporo, February 1927.

In this paper 48 species of Aphids are recorded from Korea, of which the following are new to science: *Macrosiphum* (*Macrosiphoniella*) *astericola*, on *Aster adustus*; *Melanoxantherium coreanum*, on *Salix* sp., attacking the branches and stems; *Chaitophorus coreanus*, on *Populus tremula* var. *daurica*; *Myzocallis nigra*, on *Quercus dentata*; and *Prociphilus clerodendri*, on *Clerodendron trichotomum*.

BOX (H. E.). **Notas sobre dos insectos perjudiciales a las matas de café en Venezuela.** [Notes on two Insects injurious to Coffee Plantations in Venezuela.]—19 pp., 10 figs., 11 refs. Caracas, Cámara de Comercio, March 1927.

The white coffee leaf-miner, *Leucoptera coffeella*, Guér., is a serious pest of coffee in Venezuela. In the course of a visit from May to July 1926, the author found all the plantations in the valley of Caracas to be infested, and it is probable that no less than 20 per cent. of the total leaf-surface was destroyed. The Eulophids, *Zagrammosoma multilineatum*, Ashm., and *Chrysocharis livida*, Ashm., which oviposit in the larva and pupate in its mines, seem to be the most important checks on *L. coffeella* in Venezuela. They do not appear to have been recorded previously from South America.

*Coccus viridis*, Green, was found on more than 10 per cent. of the coffee bushes in one locality. It might become a serious pest were it not kept down by natural enemies, especially an apparently new Coccinellid of the genus *Azya*. *A. orbigera*, Muls., is well-known as predacious on various Coccids in South America, including Venezuela, and has been sent to Porto Rico in the hope of establishing it there. *A. trinitatis*, Mshl., was also noticed on bamboo, feeding on a scale.

SIMMONS (P.). **The Cheese Skipper as a Pest in Cured Meats.**—U.S. Dept. Agric., Dept. Bull. 1453, 55 pp., 1 pl., 10 figs., 83 refs. Washington, D.C., January 1927.

An account is given of the life-history and habits of *Piophilus casei*, L. (cheese and ham skipper) [*R.A.E.*, A, x, 397]. Females are generally mated a few minutes after leaving the puparium, and about 10 hours later begin to scatter eggs rapidly over the surface of meat or in the crevices, one female depositing from about 100 to nearly 500 eggs over 3 or 4 days. At low temperatures (48 to 50° F.) the flies may live for more than a month, and at 80 to 90° F. for 3 or 4 days without food or water. Adults of both sexes are attracted to light, but the stimulus is not dominant in the presence of food odours, and the larvae are repelled by light. Eggs hatch in about 24 hours at 80 to 90° F., and the larvae feed for about 5 days. The life-cycle may be completed in 12 days, so that in Washington in summer there are two generations in a month. Reproduction can take place between 56 and 102° F.

Numbers of the Pteromalid parasite, *Pachycrepoideus dubius*, Ashm., were reared from the pupae, but there is small probability that it will ever be of much assistance in control. Several insect associates of *P. casei* are predacious upon it, the chief among these being the Clerid beetle, *Necrobia rufipes*, DeG. (ham beetle), which is predacious in both adult and larval stages.

Methods of control suggested, besides screening and fumigation, include wrapping each piece of meat in paper and enclosing the whole in a tight cloth sack, often with a coating of yellow wash, composed of 3 lb. barium sulphate, 1 oz. dry glue, 1½ oz. lead chromate and 6 oz. flour to about half a pail of water, as an additional protection. When curing and smoking operations are confined to the winter months, with temperatures below the minimum for reproduction (about 56° F.), the danger of early infestation is avoided.

RITCHIE (A. H.). **Entomological Report, 1925-26.**—*Tanganyika Terr. Rept. Dept. Agric. 1925-26*, pp. 33-36. Dar-es-Salaam [1927].

Cockchafer larvae, including several species of *Anomala* and *Adoretus*, have caused considerable damage in forest nurseries. A Galerucid, *Exora* sp., destroyed the foliage of Usambara camphor (*Ocotea usambarensis*). Considerable injury to maize has been done by *Diatraea argyrolepida*, Hmps., which attacks the stems and cobs and is also a serious pest of *Sorghum*. Other maize pests are *Busseola fusca*, Fuller, which also attacks sugar-cane; *Heliothis* (*Chloridea*) *obsoleta*, F., which is a serious pest of leguminous crops, especially *Cicer arietinum* and *Cajanus indicus* and also destroys the young seed-heads of sunflower; *Laphygma exigua*, Hb., causing serious injury to the foliage and young plants; *Aphis maidis*, Fitch, which also occurs on *Sorghum*; and *Peregrinus maidis*, Ashm. *Sorghum* with a soft type of grain is attacked in the field before harvest by *Sitotroga cerealella*, Ol., and *Calandra oryzae*, L., the two insects being apparently attracted by the compact seed-head of this type as compared with the native types with open panicles. *Laphygma exempta*, Wlk., attacks the foliage of young *Sorghum*; its parasites include the Ichneumonid, *Paniscus luteolus*, Tosq., and the Braconid, *Disophrys* sp. An Anthomyiid, *Atherigona* sp., is responsible for "dead-heart" in young plants, which leads to profuse tillering; it is a serious pest of late-planted *Sorghum* and millet (*Panicum miliaceum*). *Sesamia calamistis*, Hmps., is the only stem-boring caterpillar present in the rice-fields of the central area; it is also a minor pest of maize. In the rice-fields it may be destroyed by hoeing over the stubble after harvest and burning the residue in piles to destroy the pupae; pupation generally occurs in the heel of the rice stem.

*Phthorimaea heliopa*, Lw., was the only pest observed during the year on tobacco, its attack being limited to old tobacco stems. Pests of sim-sim [*Sesamum*] are the Pentatomid, *Phrycodus hystrix*, Germ., puncturing the seed capsules; the Halticid, *Aphthona bimaculata*, Jac., attacking the foliage; the Aphid, *Myzus persicae*, Sulz., sucking the growing tips; and a Lepidopterous leaf-webber, probably *Antigastra catalaunalis*, Dup., which binds the growing tips and causes terminal distortion of the plants. None of these pests, however, caused any serious damage to the crop. Sunflowers are attacked by *Prodenia litura*, F., and the Coccinellid, *Epilachna punctipennis*, Muls., which feed

on the foliage, and the Tettigometrid, *Hilda patruelis*, St., colonised by ants at the leaf axils and puncturing the stems.

*Physothrips xanthoceros*, Hood, is present in the coffee plantations throughout the year in negligible numbers; a spray of lime-sulphur should be applied after the short rains of November and December so as to prevent or considerably reduce the possible increase of the pest during the dry, hot period before the big rains. Considerable success has attended the use of the poison syrup [R.A.E., A, xiv, 229] against *Antestia* (coffee bug), the ineffective and expensive method of hand picking having been entirely abandoned. The barking of newly set-out coffee, formerly attributed to cutworms, is caused by *Gonocephalum simplex*, F., which works behind the cutworm shields. Paris green bait (1 lb. to 60 lb.) mixed slightly damp should be applied around the trees in the evening. Coccids in general are minor pests of coffee in Tanganyika, those recorded are *Coccus (Lecanium) viridis*, Green, *C. (L.) elongatus*, Sign., *Pseudococcus perniciosus*, N. & W., *P. virgatus*, Ckll., *Cerococcus hibisci*, Green; and *Saissetia hemisphaerica*, Targ. *C. viridis* is attacked by the Noctuid, *Eublemma costimacula*, Saalm., and the fungus, *Cephalosporium lecanii*; it may be controlled by spraying young coffee with lime-sulphur (1:15). *Anthores leuconotus*, Pasc. (white borer) may be easily controlled by removing the larvae from the galleries by means of a wire. The borer is particularly injurious at low altitudes unsuitable for coffee, but seldom attacks this plant at higher altitudes; it is, however, generally distributed throughout the Territory. *Dirphya (Nitocris) usambica*, Kolbe (yellow borer) is apparently confined to the western Usambaras and attacks neglected coffee. *Stephanoderes hampei*, Ferr., is still confined to Bukoba, while *Apate monacha*, F., the adults of which bore in the coffee stems, is rarely troublesome.

As a result of strict attention to thorough uprooting of plants at the end of the season, *Apion xanthostylum*, Wagn., is now scarce in the cotton fields. A pink scavenger worm has now been identified as *Pyroderces coriaccella*, Snell., and the leaf-miner as *Acrocercops bifasciata*, Wals., not *Gracilaria* sp., as recorded in German literature. *Argyro-ploce leucotreta*, Meyr., has been bred from pomegranate and custard apple [*Ancna reticulata*], but there is so far no record of its infesting cotton even in the vicinity of these trees, though it is reported in cotton bolls in Uganda. *Diparopsis castanea*, Hmps., does not occur in the main cotton-growing section, but has been recorded from a district adjoining Nyasaland where cotton cultivation was first begun in 1925. The larvae of *Syagrus rugifrons*, Baly, attacked the underground stems of cotton in one locality. It is not an important pest at present, but would be difficult to control should it appear in serious numbers. *Retithrips aegyptiacus*, Marchal, occurs generally throughout the Territory, but is apparently only a serious pest where cotton is grown in hot, dry, exposed conditions. It may then entirely defoliate the plant and also attack the bolls. The generally inadequate preparation of the soil in a season of light rainfall followed by sunless weather prevented the bolls from opening satisfactorily and thus presented ideal conditions for the rapid multiplication of *Dysdercus*. It is hoped that the poison syrup found effective against *Antestia* may be adapted with equal success against cotton-stainers. The incidence of pink bollworm [*Platyedra gossypiella*, Saund.] was extremely variable even in neighbouring plantations; the principal point now requiring investigation in Tanganyika is the method of aestivation. Prolonged

aestivation in a seed-mass is not known, and the seed distributed for planting in late January and February is, from a practical point of view, free from the pest. The few larvae that have been found were weakened, and attempts to feed them to maturity have so far failed. At the end of the season the mature or almost mature larvae leave the uprooted plants almost immediately and enter the soil for pupation; about 7-10 days after uprooting, very few live larvae remain in the bolls, and any immature ones that remain for feeding are killed under the conditions of the hot moist bolls. It is believed that the period between crops may be bridged in two ways, either by aestivation under certain soil conditions as yet unknown or by breeding in some wild food-plant not yet discovered. Pupae of end of season larvae emerged as short-cycle adults in the insectary.

[**Miscellaneous Entomological Notes.**]—*Farming in S. Africa*, i, no. 1, pp. 10, 21, 23, 29 & 36, no. 2, pp. 54-55, no. 3, p. 103, no. 4, pp. 124 & 144, no. 5, p. 152, 3 figs., p. 174, no. 8, p. 269, no. 10, p. 395, & no. 11, p. 416. Pretoria, April 1926-February 1927. [Recd. November 1926-March 1927.]

For convenience in reference each page reference is treated in a separate paragraph in this abstract.

Observations on the pests occurring in a recently settled area in the Transvaal were made in January 1926. No evidence of the occurrence of *Busseola fusca*, Fuller (maize stalk borer) or *Lema bilineata*, Germ. (tobacco slug) was found. In one locality orange trees had been so severely infested with citrus psylla [*Trioza merwei*, Pettey] that no fruit had set. Larvae of the fruit-fly, *Pterandrus rosa*, Kar., were found in peaches. Serious damage to transplanted tobacco had been caused by wingless weevils, the chief of which were *Protostraphus amplicollis*, Fhs., and *P. barbifrons* Fhs.

A Chrysomelid, *Monolepta pauperata*, Erichs., is recorded as being very destructive to vines, vegetables and garden plants at Lady Grey (north-eastern Cape Province). Injury to cotton in the eastern Transvaal by bollworms was not very severe up to the end of February 1926; the status of the red bollworm [*Diparopsis castanea*, Hmps.] remained about the same, this species being responsible for about 10 per cent. of the bollworm damage; *Heliothis (Chloridea) obsoleta*, F., occurred in two waves, in January and February, and caused perhaps 30-40 per cent. loss on some farms; spiny bollworms [*Earias*] were very scarce. Insect damage to cotton in Zululand was slight; *Syagrus rugifrons*, Baly, was present in a few fields but much less injurious than in the previous season; red spider [*Tetranychus* sp.] also occurred in several fields, being more in evidence on low-lying ground where it probably passed the winter on weeds. In the Barberton district (Transvaal) a sudden and very severe outbreak of *H. obsoleta* occurred in January, almost every square and boll and even the leaves of early cotton being destroyed on several farms, although later cotton escaped injury; alarm was caused by the advance of a column of *Laphygma eximpta*, Wlk. (mystery army worm), reported to be several miles long, but cotton was not attacked.

A Coreid, *Acanthomia tomentosicollis*, Stål (bean bug) was injurious to beans in the Uniondale district (Cape Province) feeding on the pods and causing them to rot, and preventing the development of seed. Spraying with 1 part tobacco extract, containing 7 per cent. nicotine,

to 50 parts water, or with a resin wash, which was less effective, killed the nymphs in a few minutes and the adults in 2-6 hours. Beans should be grown in rows 2 feet apart to facilitate control; the bugs can easily be shaken from the plants and may be sprayed on the soil: they shelter in large numbers under rubbish or stacked bean plants, especially in cool, rainy weather.

The larvae attacking plantations of *Pinus insignis* in the Cape Province [R.A.E., A, xiv, 411] are believed to be those of the Saturniid, *Nudaurelia cytherea*, F., which hibernates as a pupa at a depth of about 6 inches, the moths emerging after the winter rains and ovipositing in the latter part of June and July. In the winter and early spring of 1925 over 300,000 pupae were dug up, and very large numbers of eggs were collected in two localities; in one case these measures appeared effective, but in the other heavy infestation persisted in September.

On 18th June 1925 cocoons of *Diparopsis castanea* and pupae removed from the cocoons were exposed to the weather at Rustenburg (Transvaal); by 19th February 1926 no moths had emerged, and all pupae examined were found to be dead. This experiment shows the importance of winter ploughing, especially in frost areas.

In the early months of 1926 outbreaks of *Laphygma exempta* occurred in the Transvaal and Natal. The larvae feed mainly on grasses, particularly the more succulent kinds, and among cultivated crops prefer grain and tefi grass [*Poa abyssinica*]. Destruction of the larvae on the veldt is not considered economic unless they can be trampled by stock or otherwise crushed, and the main object should be to prevent them from attacking grain or grass crops; tefi should be harvested, and young crops should be protected from invasion by the use of a poison bait consisting of 1 lb. sodium arsenite (or other arsenical) dissolved in 16 gals. water sweetened with 2 lb. sugar or 2 qts. molasses, this being sufficient to moisten 150-200 lb. bran or finely chopped green grass; chopped grass should be immersed in the liquid and then drained. A few furrows should be ploughed in front of the advancing larvae and heavily baited. If the crops are attacked the bait should be scattered thinly, the above quantity being enough for about 2 acres.

*Heliothis obsoleta* was extremely abundant in South Africa in the spring of 1925, and the larvae caused considerable injury to young fruit in the citrus groves of the Transvaal and the deciduous fruit orchards of the Orange Free State and Cape Province; 60 per cent. of the peaches, 30 per cent. of the plums and 5 per cent. of the pears in one district were unfit for export owing to scars made by them early in the season.

Experiments were carried out to discover the effect of treatment in hermetically sealed containers with carbon bisulphide on the subsequent germination of maize. Two samples of maize were used, having moisture contents of 12.3 and 14.5 per cent., and varying quantities were put into tins of uniform capacity and treated with carbon bisulphide in quantities corresponding to 3 pints (4½ lb.) and 6 pints (9 lb.) to 1,000 cubic feet. Half of the tins were opened after 3½ months and the other half after 6 months, and germination tests were made. There was no injury to the drier sample after 3½ months, but slight injury after 6 months, while the moister sample showed considerable deterioration after 3½ months and was severely injured in 6 months. The injury was greater with the larger amount of carbon bisulphide, and was greater in tins only one-fourth or one-half filled with maize than in those completely or nearly filled. It is therefore recommended that the amount

of carbon bisulphide should be calculated on the basis of the quantity of grain, not the volume of the container, that the smallest quantity necessary to destroy weevils should be used (this has not yet been determined, but 4-5 lb. to 1,000 cu. ft. should be ample), and that maize to be treated should be dried first until it has a moisture content as low as possible.

A farmer in Griqualand East reports that maize planted in September on land ploughed in autumn (May) and again in September was destroyed by cutworms, while maize planted in September on land ploughed only once, immediately after burning stubble and weeds in August, was free from infestation; he considers that this supports his belief that winter ploughing under the cold, dry high veldt conditions is not a means of controlling cutworms, and that they feed on the dry trash, stubble and weeds that are ploughed under and remain undecomposed until the spring. The Cedara School of Agriculture states that these results conflict with the mass of evidence on the effect of winter ploughing on cutworms, and considers that winter weeds, and not trash, were probably the cause of the infestation on the land ploughed twice, as autumn ploughing, under certain conditions, does not keep down winter weeds, the exact time of ploughing being of great importance. Cutworms do not thrive on dry grass, dry weeds, stubble or cow-dung, although able to subsist on them for a time.

The sweet potato sphinx moth [*Herse convolvuli*, L.] is a common pest in South Africa, especially in the Transvaal, Natal and eastern Cape Province, but is not generally abundant. In the past six years, however, hundreds of acres of sweet potatoes in the Bathurst district (Cape Province) have been almost completely defoliated by it. The eggs are laid on the leaves and hatch in 6-10 days; the larvae pupate in earthen cells in the ground and the moths emerge about a month later, in the summer. There are three generations a year, the first in November, the second towards the end of January or early in February and the third in March; the pupae of the third generation hibernate from early April to November. Natural enemies include the white-bellied stork [*Ciconia nigra*], flocks of which destroyed large numbers of the larvae on several occasions. When the infested area is small the larvae may be collected by hand, but large areas should be sprayed with 1½ lb. lead arsenate powder to 40 gals. water or 1 lb. Paris green and 2 lb. lime to 75 gals. water. Winter ploughing exposes the pupae, which may be collected.

The root gall-worm [*Heterodera radicolica*, Greeff] attacks the roots of a very large number of plants in South Africa; stone-fruits, fig, mulberry and vines are much infested, peach, which is the stock most used for stone-fruit trees on sandy soils, in which the Nematodes thrive best [*R.A.E.*, A, x, 338], being particularly susceptible. Care should be taken in planting orchards of susceptible trees that the roots not only of the trees but also of the weeds growing on the land in which they are to be planted are free from infestation.

Even in the colder parts of South Africa the vegetable-marrow or melon flies [*Dacus brevistylus*, Bez., *D. vertebratus*, Bez., etc.] pass the winter in the adult stage, and may be seen sheltering on leafy trees such as *Citrus*, while they fly actively on warm, sunny days when the shade temperature is 62° F. or over. When the citrus fruit begins to ripen at the end of July, the flies are attracted to the part of the orchard in which *Citrus* is growing and desert other leafy trees; many more flies are caught in a trap hanging over a barrel containing waste citrus

fruit than in any other of several hundred similarly baited traps hung in other parts of the orchard. It is suggested that tins of bait consisting of 3 lb. pollard (bran or maize meal would probably be equally good), 12 oz. treacle, 4 oz. borax, and water to make 4 gals., should be placed here and there in the winter, especially near leafy trees, on ground where susceptible vegetables were grown in the previous summer or are to be grown, and that the bait should be used more freely in the summer among the plants from the time when the earliest marrows, etc., are about half grown. The bait is rendered more attractive by the addition of chopped citrus fruit, but is very effective without it. Arsenicals should not be added, as they prevent fermentation, and most of the flies that feed at the tins are drowned.

Two species of cutworms were causing serious damage to strawberries in Natal in October and November 1926; the larvae bored into the ripe berries and frequently remained inside them during the day instead of entering the soil. A large Cetoniid also caused nearly as much damage to the fruits as the cutworms. None of these insects has been recorded previously as attacking strawberry fruits. The cutworm damage was reduced by using the sodium fluoride and prickly-pear cutworm bait [*R.A.E.*, A, xiii, 39], but this had no effect on the beetles. Pieces of bait that came into contact with the fruit damaged it, causing it to go soft within 24 hours.

A Carabid, *Harpalus natalensis*, Boh., destroyed young beetroots in Natal; it could probably be controlled with a poison bait consisting of green-stuff wetted in a solution of 1 lb. sodium arsenite in 10 gals. water, or with the sodium flouride and prickly-pear bait. This appears to be the first record of an injurious Carabid in South Africa.

**Destructive Insects in Wattles and Gumtrees.**—*Farming in S. Africa*, i, no. 1, p. 17. Pretoria, April 1926. [Recd. March 1927.]

RIPLEY (L. B.). "**Froghopper**" in Wattles.—*T.c.*, no. 11, p. 423. February 1927.

Considerable areas of very young wattle trees in Natal were completely destroyed in November 1925 by the larvae of *Euxoa segetum*, Schiff.; it is only when these cutworms are very abundant and when weeds are scarce that they do serious damage to these trees, as they prefer weeds. Damage to wattle can therefore be avoided by not burning brush from September to November. A case of serious loss of young trees of [*Eucalyptus*] *saligna* in a nursery in Natal due to an attack by crickets was reported; the crickets were completely controlled by a single application of the sodium fluoride and prickly-pear bait [*R.A.E.*, A, xiii, 39].

Malformations of young wattle trees up to two years old, known as "froghopper" damage, are caused by Jassids and a Capsid. These bugs feed on the leaves, on which the saliva that they inject produces dead spots, resulting in the withering and shedding of the leaves. When the terminal leaf bud is attacked a "witch's broom" or cluster of leaders is produced instead of a single shoot; this finally causes a crook in the timber, as the dominating leader does not follow the line of the original trunk exactly. Serious injury only occurs when trees more or less weakened by drought or injury to the roots are attacked by large numbers of Jassids or Capsids. *Bythoscopus cedaranus*, Naudé, which was held to be chiefly responsible for the damage in the

previous year, was not found associated with it in January 1926; the fluctuation in the numbers of this Jassid is possibly caused by its natural enemies, the immature stages being attacked by a Pipunculid fly, which is an internal parasite, and by the larva of a Coccinellid. To prevent "froghopper" damage it is necessary to avoid root injury by cultivation during the dry season, to avoid thinning where the insects are abundant, as they will then concentrate on the remaining trees, and to avoid isolating very small trees as individuals or in narrow lines, as these are much more liable to be heavily attacked; too long a delay before removing the trees, however, causes stunting. The gradual removal of growth between the lines seems a promising method by which the damage is controlled.

**Damage by Eucalyptus Snout Beetle.**—*Farming in S. Africa*, i, no. 1, p. 32. **Spread of the Eucalyptus Snout Beetle.**—*T.c.*, no. 3, p. 80. **Eucalyptus Snout Beetle. Extent to which Different Kinds of Eucalyptus are attacked.**—*T.c.*, no. 5, p. 168. Pretoria, April, June & August 1926. [Recd. March 1927.]

In connection with a request for information on the control of the eucalyptus snout beetle [*Gonipterus scutellatus*, Gyll.], it is stated that the larvae and adults are readily killed by dusting plantations of *Eucalyptus* with calcium arsenate at the rate of 15–20 lb. to the acre, but that the extensive use of aeroplanes for this purpose is probably impracticable [*R.A.E.*, A, xv, 113]. Shallow ploughing in autumn and winter to destroy the hibernating larvae in the soil appears to have given good results in some cases, and may prove a useful measure. If the weevils are disturbed when on the trees, many of them fall to the ground and feign death, and it is suggested that they should be shaken from the trees on to canvas sheets, from which they could be thrown into a tin containing water with a film of oil. In warm sunshine many of the beetles on trees more than about 10 feet high take flight when disturbed and settle again on the trees, although some fly to the ground, but almost all the beetles on small trees drop to the ground. After the beetles have been collected the tips of the new growth should be examined and any leaves bearing capsules of unhatched eggs should be destroyed.

The occurrence of *G. scutellatus* in the extreme eastern part of the Free State and in Griqualand East (eastern Cape Province) is recorded. At Krugersdorp (Transvaal) beetles were found sheltering in the stem depressions of apples that had been picked from an orchard close to infested *Eucalyptus*, approximately one apple in five having a beetle on it; during the winter the beetles can exist for weeks without food, and it is suggested that the pest may have been originally introduced into South Africa in apples in this way. In April and May large numbers of beetles cluster in the drying seed-heads of grasses; this habit should sometimes offer a good opportunity of destroying them by burning.

Further observations on the susceptibility of different species of *Eucalyptus* to attack by *G. scutellatus* have been made in fairly heavily infested areas in Natal, Transvaal and the Cape Province, and a list of species classified according to the degree of infestation is given; this list supersedes those previously noticed [*R.A.E.*, A, xiii, 38; xiv, 200, 231]. Less than one-third of the species are much attacked, and more

than one-third are not attacked at all, but *E. viminalis* and *E. globulus*, which are among those most severely attacked, have been extensively planted in certain areas.

MOSSOP (M. C.). **Insect Enemies of the Eucalyptus Snout-beetle.**—*Farming in S. Africa*, i, no. 11, pp. 430–431, 6 figs. Pretoria, February 1927.

The larva of the eucalyptus snout beetle [*Goniapterus scutellatus*, Gyll.] is attacked in South Africa by two indigenous Reduviids and five indigenous Pentatomids. One of the Reduviids occurs in the Cape Province, and the other, *Harpactor pulvisculatus*, Dist., in the Transvaal; the latter, which lays its eggs under loose bark, attacks the adults as well as the larvae. Of the Pentatomids, which appear to be much more important than the Reduviids, two species, one of which is *Macrorhaphis leprosa*, Germ., occur in the Cape Province, two in the Transvaal, and one, *Dorycoris pavoninus*, Westw., in Natal. The commoner of the Transvaal species is *Glypsus conspicuus*, Westw., the stages of which are figured and briefly described. The eggs are laid on twigs in batches of about 30. One female laid 119 eggs in four batches of from 12 to 59, during 2½ months in captivity. From February to April the eggs hatched in 18–20 days. The nymphs, on hatching, are gregarious and apparently do not feed for several days. A later stage nymph or an adult destroys one larva of *G. scutellatus* about every two days, but frequently goes without food for several days. The way in which the winter is passed has not been determined, but it is probable that the adults hibernate under bark or debris.

MUNRO (H. K.). **A South African Mason-wasp as Insect Killer.**—*Farming in S. Africa*, i, no. 2, pp. 51–52, 4 figs. Pretoria, May 1926. [Recd. March 1927.]

A short account is given of the bionomics of *Eumenes maxillosus*, DeG. Several nests of this wasp from the Orange Free State and Pretoria, consisting of from 6 to 20 or more cells, were provisioned entirely with larvae of *Heliothis (Chloridea) obsoleta*, F., of which each cell contained about 10. The wasps were reported to be very numerous in the localities from which the nests were sent.

VAN DER MERWE (C. P.). **A Moth that Destroys our Fruit.**—*Farming in S. Africa*, i, no. 2, p. 53. Pretoria, May 1926. [Recd. March 1927.]

Large swarms of adults of the fruit-piercing moth, *Achaea lienardi*, Boisl., occurred in Natal in February 1926, especially in Durban. Birds, mainly mynabs, fed on the moths, which were also eaten to some extent by monkeys. The larva of *A. lienardi* is a pest of wattle, but no reports of severe injury by it have been received, and it is possible that the swarms of moths had travelled long distances. The moths, by sucking the sap from the fruit, produce dry spongy spots in the flesh, and decay frequently follows the injury. The fruit may be protected by covering the trees with netting, but this is too expensive for general use.

JOUBERT (C. J.). "**Pear Mealy Bug**" on Apricots.—*Farming in S. Africa*, i, no. 2, p. 64. Pretoria, May 1926. [Recd. March 1927.]

*Pseudococcus maritimus*, Ehrh. (*capensis*, Brain), which is well known as a pest of pears and vines in the western Cape Province, and has been found on about 40 other food-plants in South Africa, is recorded for the first time as attacking apricots. Most of the trees in an orchard of 250 were infested, especially on the new bark around wounds left by pruning. The position of the apricot orchard in relation to an infested pear orchard about 150 yards away, and the prevailing winds during August when the eggs were hatching, suggested the probability of the mealybugs having been carried to the apricot trees by the wind. The infestation was, however, thought to be new and similar prevailing winds had occurred in previous years, but the apricots had hardly flowered before 1925, in which year their flowering period coincided with that of the pears, in the fruit buds of which larvae of the mealybug were common at the end of the winter; the possibility that the dissemination was effected by bees is therefore suggested. Birds, although known to be capable of carrying Coccids from one plant to another, are unlikely to have been responsible in the case under consideration. It is improbable that apricot fruits will be injured by *P. maritimus*, as they are all picked about the middle of December, while noticeable injury to pears does not occur until the latter part of January.

TUCKER (R. W. E.). **The Argentine Ant : a Suitable Poison**.—*Farming in S. Africa*, i, no. 3, p. 78. Pretoria, June 1926. [Recd. March 1927.]

The Argentine ant [*Iridomyrmex humilis*, Mayr] is well established in the southern parts of the Union of South Africa, extending through the Orange Free State as far north as Johannesburg in the Transvaal, and is the commonest ant in houses. For the control of this pest in and around houses the use of a weak poison is recommended [cf. *R.A.E.*, A, viii, 285]: 4 lb. sugar, a pinch of tartaric acid and 3 pints of water are boiled for 30 minutes; the resulting solution, together with  $\frac{1}{2}$  lb. honey, is then added to 1 pint of water in which  $\frac{1}{4}$  oz. sodium arsenite was dissolved while hot. Tables, shelves, etc., may be protected from the ants by the application, either direct or on to a piece of tape, of an alcoholic solution of mercury bichloride.

**Control of Maize-stalk Borer**.—*Farming in S. Africa*, i, no. 3, p. 91.  
**Maize-stalk Borer**.—*T.c.*, no. 8, p. 276. Pretoria, June & November 1926.

WAHL (R. O.) & OTHERS. **The Maize-stalk Borer** (*Busseola fusca*, Fuller).—*T.c.*, no. 8, pp. 279–282, 3 figs.

A farmer in the high veldt region of the Transvaal claims to have obtained good results in controlling *Busseola fusca*, Fuller (maize stalk borer) by cutting the young maize down to the ground and covering the stumps over with earth. All the plants were showing above ground in two days and their average height in 36 days was 6 feet. This method overcomes the difficulty that it is usually too late to re-sow after the

first crop has been destroyed. Not all the larvae are destroyed, as the oviposition period is long, but the few plants of the new growth that become infested can be treated individually.

A summary of the detailed records of infestation of maize by *B. fusca* in two fields at Potchefstroom, Transvaal, in July and August, shows that in one 85 per cent. and in the other 50 per cent. of the stalks were attacked, the estimated number of live hibernating larvae being respectively 1,400 and 1,075 to the acre.

A short account is given of the life-history of *B. fusca* and its control from the point of view of those who grow maize for grain and not for silage. With the exception of a paragraph dealing with Dr. Ripley's experiments [see next abstract] almost all the information is dealt with more fully in a paper previously noticed [*R.A.E.*, A, ix, 217]. *B. fusca* is the most serious pest of maize in the high veldt region, where it probably causes loss considerably greater than 10 per cent., which is considered to be the average annual loss in South Africa, and the damage that it does appears to be increasing.

RIPLEY (L. B.). **Top-dressing of Maize against Stalk-borer. Results of Tests.**—*Farming in S. Africa*, i, no. 5, pp. 153-154. Pretoria, August 1926. [Recd. March 1927.]

**Top-Dressing Maize against Stalk-borer. Unexpected Damage with Derrisol.**—*T.c.*, no. 10, p. 392. January 1927.

Investigations have been carried on for two years in an attempt to discover a substance that can be applied to young maize to kill the larvae of the maize stalk-borer [*Busseola fusca*, Fuller] without injuring the leaves. The only one of the many insecticides tested that effectively controlled the larvae without scorching the leaves was derrisol, a combination of derris extract and soap, which, at a strength of 1 : 150, was much more toxic than 40 per cent. nicotine sulphate, 1 : 300. The cost of applying derrisol at the rate of a tablespoonful to each plant is 7-10 shillings an acre, exclusive of labour, and although this is rather high, it would not be uneconomic on heavily infested maize that was yielding well. Of other liquid insecticides tested the most promising were carbolic sheep dips and disinfectants and a sheep dip containing derris; these dip fluids, especially the last, gave satisfactory control at 1 : 100 [*cf. R.A.E.*, A, x, 339], but produced considerable scorching of the leaves. Whether the scorching causes an appreciable diminution in the yield has yet to be determined experimentally. Several dusts were also tested, but the only one that gave satisfactory control, sodium fluosilicate, caused severe scorching when used undiluted; dilution with 9 parts by volume of slaked lime may, however, eliminate the scorching. Calcium cyanide dust is highly destructive to young maize plants, and stomach poisons such as lead arsenate are repellent to the larvae, causing them either to bore deeper or leave the plant and re-enter it at the bottom of the stalk, thereby doing more damage.

A later note states that a case of severe injury to maize, in the form of a delayed and peculiar form of plant poisoning, following the use of derrisol, has been reported; this injury did not occur on the experimental plots, even when the insecticide was applied at a much greater strength than 1 : 150.

**Baiting Cutworms in Maize Lands.**—*Farming in S. Africa*, i, no. 3, p. 100. **Sodium Fluoride and Cutworms.**—*T.c.*, no. 12, pp. 465–466. Pretoria, June 1926 & March 1927.

The first of these notes records that a farmer obtained successful control of cutworms on maize lands by using sodium fluoride bait [*R.A.E.*, A, xiii, 39] at 20 lb. instead of 200 lb. to the acre, as recommended [*R.A.E.*, A, xiv, 121]. It is pointed out, however, that this was on land where winter ploughing and clean spring cultivation had been practised. At Cedara 75 lb. to the acre gave good control on land absolutely free from weeds, but it is advisable to use not less than 100 lb., while 100–200 lb. should be used where weeds are present. Even 200 lb. to the acre will not give satisfactory results if the ground is very weedy.

The second note is a reprint of a previous one [*R.A.E.*, A, xiii, 39] with additional recommendations. In order to overcome the difficulty of ploughing maize land in the winter, when cattle are usually fed on the stalks in the fields, and when the ground is often very hard, it is suggested that the stooks of maize should be placed in a few lines, and that the land between should be ploughed in the autumn. This will result in the occurrence of weedy patches on the unploughed land where the stooks have stood. The cutworms will concentrate on the weedy patches during the winter, and bait can be applied to them only after the spring ploughing. If a cutworm outbreak has not been anticipated, the bait can be applied after the maize is up, one or two pieces being placed near each plant; this method is less expensive than broadcasting before the crop is up, costing about 3 shillings an acre, but it is less effective.

[VAN DER MERWE (C. P.).] **The Sweet-potato Weevil.**—*Farming in S. Africa*, i, no. 4, pp. 116–117, 4 figs. Pretoria, July 1926. [Recd. March 1927.]

The occurrence of *Cylas formicarius*, F. (sweet potato weevil) along the east coast of South Africa from northern Natal to the Transkei district (Cape Province) is not viewed with alarm, as it is now known to have been present for many years, and may be indigenous [*R.A.E.*, A, xii, 393]. It infests a native plant, *Ipomoea biloba*, and only causes material losses to sweet potatoes [*I. batatas*] by attacking tubers that are exposed in the fields; it attacks also the older parts of the stems, but the method by which slips are made in South Africa makes it unlikely that it will be spread by means of infested slips, and no restrictions on the transport of tubers or slips have been made. A brief account is given of the life-history, which is similar to that recorded in other parts of the world [*R.A.E.*, A, xii, 333, 575; xiv, 5]. The control measures suggested include growing sweet potatoes in sandy soil, as cracks in the soil give the weevils access to the tubers, growing deep-rooting varieties, crop rotation, and careful cleaning up after the crop has been harvested.

SKIBBE (A.). **Water Extract of Tobacco. Solution for spraying Trees.**—*Farming in S. Africa*, i, no. 4, pp. 137–138. Pretoria, July 1926. [Recd. March 1927.]

A spray solution for the control of Aphids on fruit trees should contain from 0.05 to 0.1 per cent. nicotine, and it was with a view to discovering

a simple way of making such a solution that water extracts of tobacco were investigated. It was found that a sufficient concentration could not be obtained with stalks and pods of Turkish tobacco, as 2 lb. to 3 gals. water gave only 0.015 per cent. nicotine, but that a concentration between 0.05 and 0.1 per cent. could be obtained by using waste leaves of Turkish tobacco in water in the ratio of 1 : 10 by weight (1 lb. to 1 gal.).

The nicotine can be extracted with either hot or cold water; if the tobacco is boiled in the water the time needed is only 5 minutes, if it is put in boiling water that is then permitted to cool 15 minutes should be allowed, and if the water is not heated, 3–5 hours, the rate of solubility in cold water being accelerated if the material is finely divided. The loss of nicotine by boiling is reduced to a minimum if the extract is made in large quantities, and the loss is still less if the water simmers. Solutions prepared with cold and hot water gave equally good control of Aphids. If Virginia tobacco, containing 1.5 per cent. nicotine, is used, the water can be increased to 2 gals. to 1 lb., and if *Nicotiana rustica*, containing 2.2 per cent. nicotine, is used, the water can be further increased to 3 gals. to 1 lb., the final extract in each case having the same concentration (0.05–0.1 per cent.).

A stronger solution of nicotine can be prepared by using 50 lb. of *Nicotiana rustica* to 18 gals. water; the tobacco is added in small quantities of about 5 lb. and allowed to simmer in the water for 5–10 minutes and is then removed and dropped into cold water, from which it is subsequently discarded after squeezing; the cold water, which contains nicotine that would otherwise be lost, is used to replenish the hot water. By this method, using 52½ lb. *Nicotiana rustica* and 21 gals. water the author obtained a solution containing 0.654 per cent. nicotine. This process of adding successive amounts of tobacco cannot be repeated indefinitely to obtain still greater concentrations as a large amount of nicotine would be removed with the tobacco, which removes about a third more than its weight in moisture, as the solution became more concentrated. The more concentrated solutions do not retain all of their nicotine if kept in a drum with a loose-fitting lid; a sample that originally contained 0.679 per cent. nicotine contained only 0.345 per cent. after three months.

GUNN (D.). **The Fig-tree Borer. Protecting the Tree Trunks.**—*Farming in S. Africa*, i, no. 5, p. 151. Pretoria, August 1926. [Recd. March 1927.]

A fuller account of the bionomics and control of the fig-tree borer [*Phryneta spinator*, F.] in South Africa has been noticed previously [*R.A.E.*, A, viii, 69].

LUNDIE (A. E.). **The Honey-bee and the Fruit Grower. How the Flowers are Fertilized.**—*Farming in S. Africa*, i, no. 10, pp. 384–387, 4 figs. Pretoria, January 1927.

This is a somewhat detailed account of the pollination of fruit trees by honey bees. In South Africa the mild climate favours the survival through the winter of wild bees and non-social insects, but these should not be relied upon to effect pollination, and hives of bees should be placed in the orchard during the flowering period, one hive to the acre being considered sufficient. To avoid poisoning the bees, the first spray for the codling moth [*Cydia pomonella*, L.] should not be applied until most of the petals have fallen.

KING (H. H.). **Applied Entomology in Relation to the Agricultural Resources of a Country.**—*Empire Cotton Growing Rev.*, iv, no. 2, pp. 137–142. London, April 1927.

Applied entomology was first recognised as an essential agricultural service in the British Empire about 25 years ago, and at that time the entomologist when appointed was expected to deal single-handed with all pests occurring throughout a country, irrespective of its size. It is now realised that this is impossible in a country of any extent, but, while it is easy to determine what agricultural staff is needed, it is not easy to decide upon the necessary strength, composition and organisation of the entomological service. The primary duty of a government entomologist is to protect the inhabitants of the country from losses due to insect pests, but in practice his activities must be far wider than this. He is frequently required to inspect and report upon the state of crops at certain intervals, or to modify control measures to meet local conditions, while native cultivators should be encouraged to regard him as one to whom they may turn whenever their crops are threatened. A large country, such as the Sudan, must of necessity be divided into definite zones or districts having climatic and agricultural conditions that are relatively uniform, and each zone should have its own laboratory, with sufficient personnel to ensure that neither field work nor laboratory research will be neglected. The work of the applied entomologist has also a certain indirect or political value to the Government in that it brings him into close contact with the inhabitants of the country, who do not fail to appreciate the value of the protection of their crops from pests.

MÜLLER (A.). **Versuche zur inneren Therapie der Pflanzen.** [Experiments in the internal Treatment of Plants.]—*Anz. Schädlingssk.*, iii, nos. 3–4, pp. 29–33, 41–46, 5 figs. Berlin, 15th March & 15th April 1927.

This paper describes a series of experiments connected with the internal treatment of plants against insects [*R.A.E.*, A, xiv, 505]. The larvae of *Nygimia phaeorrhoea*, Don., and freshly cut pear twigs were used to test both non-poisonous repellents and poisons, including arsenic trioxide, tannin, pyridin, etc. *N. phaeorrhoea* is known to be very resistant to stomach-poisons, and though it was found that the internal treatment of the twigs with one undefined substance did poison the caterpillars, the results are not of any practical value at present.

MORSTATT (H.). **Schaden und Bekämpfung der Baumwollwanzen.** [The Injuriousness and Control of Cotton Bugs.]—*Der Tropenpflanzer*, xxx, no. 4, pp. 150–155, 2 figs. Berlin, April 1927.

This is a general discussion of the injury done by cotton-stainers, *Dysdercus* spp., and the measures adopted against them. Twenty-two species are known as cotton pests in Africa, India, Australia, and Central and South America. Of the large cotton-growing regions, only Egypt, South Russia, Mesopotamia and the United States are free from infestation.

THOMPSON (W. R.) & PARKER (H. L.), U.S. Bur. Ent. **The Problem of Host Relations with Special Reference to Entomophagous Parasites.**—*Parasitology*, xix, no. 1, pp. 1–34, 11 refs. Cambridge, March 1927.

One of the fundamental problems of insect parasitism is that of host-relations. The fact that a given parasite attacks several hosts makes it very difficult to determine what part it plays in the control of a particular insect pest and renders it impossible to foresee exactly what it will do in a new environment. In spite of the mass of facts available for study, ideas on the fundamental problem of parasitic specificity are still extremely obscure. If the exact nature of the attraction exerted by a host upon its parasites could be defined in a scientific manner, the whole treatment of parasitological problems would be greatly simplified and facilitated. It would then be possible to predict what hosts a given species would attack in any region; the probable action of a parasite introduced artificially into a new country could be estimated; and the part played by native parasites in relation to pests imported from abroad could be predicted. To arrive at such a result, it would be necessary to determine exactly what group of qualities exerts the maximum attraction on the parasite; it would also be necessary to determine, not only the qualities by virtue of which the host attracts the parasite, but also what characteristics the parasite must present to be susceptible to the attraction. This would obviously necessitate a great amount of laborious and exact investigation, which would, however, be justified in view of the importance of the results to be obtained, if it could be shown that the solution of the problems under discussion were really possible. The main purpose of this paper is, therefore, to examine the general problem of parasitic specificity with the object of determining to what extent it is amenable to scientific treatment.

The work included extensive laboratory observations on the Chalcid, *Melittobia acasta*, Wlk., and a detailed study of the data available on the host-relations of the Tachinid, *Comptosilura concinnata*, Mg. The results indicate that the hosts of related parasites, though sometimes similar, are not necessarily so, and may be very different, and that parasites so similar as to be morphologically inseparable in most or all stages of development may have different host-relations. The choice of host is primarily a phenomenon of a psychological order that can be understood by analogy with a similar process, such as the choice of food.

The choice of host, like the choice of food, is not a phenomenon that can be referred to any constant and definite efficient cause exterior to the organism. The processes of host and food selection seem to be due to deduction by the animal from perceptible qualities, and in either case the cause of behaviour cannot be defined in terms of physico-chemical or morphological properties. There is no reason to suppose that any conscious judgment occurs in the animal mind. This conception, which corresponds to the idea of instinct, is the only one that seems to fit all the facts of the case.

There is thus no reason to suppose that the accumulation of data will ever lead to the discovery of laws of parasitic distribution permitting the correlation of properties of parasites with those of their hosts, so that the hosts of a given parasite or the parasites of a given host can be predicted in advance. In problems involving the practical use of entomophagous parasites, such as their importation from one country to another, it is impossible to foretell the behaviour of the parasite with

regard to the possible host-insects of the new area. The results cannot be judged in advance from investigations in the native home of the parasite, and can only be solved by experiment.

MCATEE (W. L.). **The Rôle of Vertebrates in the Control of Insect Pests.**—*Ann. Rept. Smithsonian Inst.*, 1925, pp. 415–437, 7 pls., 52 refs. Washington, D.C., 1926.

The importance of birds, which are the chief vertebrate enemies of insects, in the control of insect pests is emphasised, and numerous instances are quoted in this connection. The views of various entomologists are given in confirmation.

PAYNE (N. M.). **Freezing and Survival of Insects at low Temperatures.**—*Jl. Morph.*, xliii, no. 2, pp. 521–546, 9 charts, 20 refs. Philadelphia, Pa., 5th March 1927.

The following is the author's abstract :—The literature on the general subject of freezing and survival both in plants and in animals is briefly reviewed and a bibliography given. Insects representing three ecological groups—1, the oak borers, exposed to temperature extremes normally ; 2, stored-products insects, representing supposedly a tropical or sub-tropical group ; and 3, aquatic insects, never exposed to temperatures lower than 0° C. [32° F.]—were chosen for this study. Determinations of the freezing and under-cooling points were made during the yearly cycle. Both 2 and 3 showed no periodicity in freezing or under-cooling. The oak borers showed marked periodicity. The freezing point varies directly with the moisture content. Cold-hardiness was produced experimentally by exposure of insects to low temperatures and also by dehydration. Loss of cold-hardiness was produced experimentally by combinations of high temperature, food and high relative humidity. The freezing-point ordinarily found corresponds with that of the blood. Repeated freezings of the same insect or tissue showed no hysteresis. There exists in certain insects a secondary freezing-point below that ordinarily found. Oak borers in summer conditions die at the first freezing-point ; in fully hardened condition they die at the secondary freezing-point.

BLAKE (A. E.). **Pest Destruction by Aeroplane.**—*Science Progress*, xxi, no. 84, pp. 688–691, 9 refs. London, April 1927.

Aeroplanes have been employed for the destruction of insect pests in the United States since 1921, and have been used against forest pests in Germany and France, and, to a slight extent, against orchard and potato pests in England.

The aeroplane used for dusting cotton in the United States had special hoppers, which deposited a thin stream of finely pulverised calcium arsenate into the current of air generated by the propeller and the drift of the plane, the velocity of which current had been raised to some 200 miles an hour by a funicular scoop. The down-draught of air then forced the powder down into the plants. When dusts are applied in this way a damp surface of the leaves is not essential, since the powder adheres even to dry surfaces, owing partly to the force with which it is blown upon the crops and partly to the minuteness of the dust particles, but chiefly to the fact that the latter, in the process of

delivery, become positively charged with electricity and come into contact with plants negatively charged. In view of this, a ground machine utilising an electrical apparatus has been invented, which may be worked in daytime, without having to wait for the night dews.

The two main types of aeroplane used for cotton dusting in the United States are a small machine for small areas, carrying 300 lb. insecticide, and a larger one for large estates carrying 1,000 lb. Both types can remain in the air for 4 hours. They fly at 5–25 ft. above the crops, at a speed of 80–90 miles an hour, and dust 75 acres a minute, in slightly over-lapping strips some 200 ft. wide. Besides cotton, spruce, pecan, tobacco, peaches, potatoes, *Citrus* and sugar-cane have been successfully dusted by aeroplane in America.

NICHOLSON (C.). **The Golden-8 Moth** (*Plusia moneta*).—*Gard. Chron.*, lxxxix, no. 2107, pp. 341–342, 1 fig. London, 14th May 1927.

*Phytometra* (*Plusia*) *moneta*, F., is a serious pest of *Aconitum* and *Delphinium*. It is a cosmopolitan species and has been established in England since 1890. The moths are on the wing from May to July and lay their eggs in the flower heads. In about a week the larvae hatch and feed on the buds, flowers and young seed vessels. In favourable conditions they reach the adult stage in August, and there is a second brood in September, but in Britain there is usually only one brood a year. The larvae hibernate in the hollow stems of their food-plant and reappear in March or April, when they feed on the buds and leaves at the tops of the shoots until fully grown. They pupate on the lower surface of the leaves about a foot from the ground, and the adults emerge about three weeks later.

**The Celery Fly** (*Acidia heraclei*).—*Gard. Chron.*, lxxxix, no. 2108, p. 359. London, 21st May 1927.

*Acidia heraclei*, L., has two generations a year, the first from late spring to early summer, living chiefly on *Heracleum sphondylium* (wild hogweed), the second, from August to October, or even later, only on parsnip and celery. Hibernation occurs in the pupal stage in the soil. The remedial measures recommended are the application of crude naphthalene, 2 oz. to 1 sq. yd., to parsnip and celery fields, and also the use of these plants as traps. The larvae are parasitised by the Braconid, *Adelura apii*, Curt.

GREEN (E. E.). **Notes on the Coccidae of Scotland**.—*Scot. Nat.*, nos. 163 & 164, pp. 25–30, 55–59. Edinburgh, 1927.

This is an annotated list of the Coccids recorded from Scotland including 17 genera and 21 species.

FRYER (J. C. F.). **The Control of Horticultural Pests—A Retrospect**. — *Essex County Farmers' Union Year Book*, reprint, 5 pp. Chelmsford, February 1927.

This is a very brief and popular account of the development of spraying for the control of insect pests since 1913 in England, and of legislation to prevent their importation. There is no doubt that better control is now being exercised, but other changes are tending to

render both insect pests and fungous diseases of greater importance. It is suggested that if the same progress is made in the next fifteen years, it should be sufficient to meet the increasing demands of horticulture.

VITALE (F.). **Les ravages du *Pantomorus godmani* Crot. (Col. Curculionidae) à Messine.**—*Bull. Soc. ent. France*, 1927, no. 5, pp. 92–93, 1 ref. Paris, 1927.

*Pantomorus godmani*, Crotch, is an exotic species, probably imported from America, which appeared in Sicily in 1909 and caused serious damage in vegetable and flower gardens from 1913 to 1920, after which year it practically disappeared though one individual was captured near Messina in October 1925. This weevil attacks numerous flowering plants and vegetables, the adult eating the leaves while the larva bores into the roots. The damage is done during the night, the weevil entering the earth beneath the damaged plant at dawn, where it may be found under stones or clods.

[VUKASOVIĆ, VOUKASSOVITCH (P.). **Sur un cas particulier de parasitisme chez *Theronia atalantae* Poda (Hym. Ichneumonidae).**—*Bull. Soc. ent. France*, 1927, no. 5, pp. 94–95, 2 refs. Paris, 1927.

A pupa of *Nemorilla floralis*, Fall., one of the most common parasites of *Psammotis hyalinalis*, Hb., observed in the course of studies carried out near Belgrade in 1926, was found to be parasitised by *Theronia atalantae*, Poda, the interior of the pupa being entirely webbed with the cocoon of the parasite. This appears to be the first recorded case of successful parasitism of Diptera by this Ichneumonid, which is an important parasite of Lepidoptera in Russia and Central Europe, one of its most usual hosts being *Malacosoma neustria*, L.

The author believes the case under consideration to be probably an instance of direct accidental oviposition in the primary parasite when already in the body of the host.

VUKASOVIĆ (P.). **Biological Observations on the Hymenopterous Parasites of Diptera Brachycera.** [In Serbian.]—*Glasnik Cent. Hig. Zavoda*, i (ii), pt. 4–6, pp. 195–211, 3 figs, 6 refs. Belgrade, 1926. (With a Summary in French.) [Recd. April 1927.]

This is a preliminary note on material collected in Jugoslavia during the past two years. The hosts are mainly the Syrphids, *Syrphus balteatus*, DeG., *S. vitripennis*, Mg., *S. pyrastris*, L., *Paragus quadrfasciatus*, Mg., and *Melanostoma mellinum*, L. The parasites recorded are *Trichogramma evanescens*, Westw., attacking the eggs; *Bassus laetatorius*, F., *Homotropus tarsatorius*, Panz., *Promethes pulchellus*, Holmgr., and *Encyrtus aeruginosus*, Dalm., attacking the larvae but emerging from the pupae; and *Pachyneuron* sp., attacking the pupae.

*Diapria conica*, F., was found parasitising *Eristalis tenax*, L. The eggs must be laid in the larva of the host, the parasitic larvae completing their development in its puparium.

[EGOROV (A. A.).] **Еропов (А. А.). The Methods by which *Phylloxera* is distributed.** [In Russian.]—*Vestnik Vinodel. Ukrain.*, xxviii, no. 1, p. 19. Odessa, January 1927. [Recd. May 1927.]

Various instances are described that illustrate the spread of *Phylloxera* from one locality to another by wind.

[BASHINDZHAGIAN (S.).] **Башинджагиан (С.). How *Phylloxera* was discovered in Azerbaijan.** [In Russian.]—*Vestnik Vinodel. Ukrain.*, xxviii, no. 1, pp. 20–21. Odessa, January 1927. [Recd. May 1927.]

The history of the discovery of *Phylloxera* in Azerbaijan in 1925 [R.A.E., A, xv, 125] is briefly described. It is considered probable that this Aphid has been present for at least seven years, but that it has been overlooked owing to the general neglect of the vineyards.

[FEDOROV (S.).] **Федоров (С.). Pests of Vines in the Crimea in 1925–26.** [In Russian.]—*Vestnik Vinodel. Ukrain.*, xxviii, no. 1, pp. 22–25. Odessa, January 1927. [Recd. May 1927.]

Of the vine pests recorded in the Crimea in 1925–26 *Otiorrhynchus asphaltnus*, Germ., caused considerable injury along the southern coast. The spring generation developed somewhat rapidly, and though the vines apparently overcame the attack on the buds and were looking healthy at the end of May and in June, the ultimate harvest showed its effects. The annual reduction of the crop as a result of injury by this weevil is estimated at 25 per cent., rising to 50–75 per cent. in years when it is very abundant. The remedial measures adopted are collection of adults at night in the spring, and spraying in the summer with barium chloride and soda.

Next in importance as a vine pest is *Theresia ampelophaga*, Bayle [R.A.E., A, xiv, 227]. During the year under review it was heavily parasitised, particularly by *Apanteles viminetorum*, Wesm., and *Charops decipiens*, Grav., which attack the larvae. *Polychrosis botrana*, Schiff., was unusually abundant; light traps were not successful. The loose bark should be removed in winter and placed in a container from which only the parasites can emerge.

Other pests recorded are *Isophya taurica*, Br.; *Anacridium aegyptium*, L., which eats individual berries in the bunch, causing it to rot, the injury frequently being attributed to birds; *Pseudococcus adonidum*, L. (*longispinus*, Targ.), which only occurred locally and was controlled by kerosene emulsion; the Bostrychids, *Schistoceros bimaculatus*, Ol., and *Psoa viennensis*, Hbst., which occurred in neglected vineyards and in others adjoining them; *Labidostomis* sp., which defoliated the vines adjacent to forests; *Antispila rivillei*, Stt., which is widely distributed but does not cause any serious injury; and *Janetiella (Cecidomyia) oenephila*, Haimh., which is very localised, but causes considerable injury by attacking the pedicels, though the formation of galls on the leaves is not of any great importance.

BODENHEIMER (F. S.). **Entomology.**—*Zionist Organ., Inst. Agric. & Nat. Hist., Agric. Expt. Sta., 1st Rept. 1921–26*, pp. 44–49, 4 pls. Tel-Aviv, Palestine, November 1926. [Recd. April 1927.]

*Cryptolaemus montrouzieri*, Muls., is being introduced from France and Egypt for the control of *Pseudococcus citri*, Risso (citrus mealybug); it is

also hoped that attempts to introduce *Opius humilis*, Silv., for the control of *Ceratitis capitata*, Wied. (Mediterranean fruit-fly), from Hawaii will prove successful. The latter is one of the most serious pests of oranges and deciduous fruits in Palestine. It has seven generations a year in the coastal plain, five near Jerusalem and ten in the Jordan Valley. *Capnodis carbonaria*, Klug, is a serious pest of almonds, the larva developing in the crown of the root. *Cimbex quadrimaculata humeralis*, Geoffr., which caused complete defoliation of the almond trees in one area in April, has been successfully controlled by the application of Urania green. This insecticide also proved effective against *Hippotion* (*Chaerocampa*) *celerio*, L. (vine hawk-moth), which occurred in large numbers throughout Palestine in the spring of 1926.

Other pests dealt with during the period under review are *Zeuzera pyrina*, L., one of the most destructive pests of olive; *Dacus oleae*, Gmel. (olive fly); and *Polychrosis botrana*, Schiff. (vine-moth).

The importance of being prepared for dealing promptly with an outbreak of *Schistocerca gregaria*, Forsk. (*peregrina*, Ol.) in 1927 or 1928 is pointed out. This locust appears to have a twelve or thirteen year periodicity in Palestine.

BODENHEIMER (F. S.) & KLEIN (H. Z.). **Studies on the Life-history and the Control of *Zeuzera pyrina* L. in Palestine.**—*P. Z. E. Agric. Rec.*, no. 1, pp. 63-88, 5 figs. Tel-Aviv, Palestine, February 1927.

*Zeuzera pyrina*, L., the various stages of which are described, is one of the most serious pests of olive and apple trees in Palestine and has also been recorded on pear, plum and *Platanus*. Owing to climatic conditions the larvae feed uninterruptedly throughout the winter, and the entire life-cycle is completed in one year. The eggs are laid on the bark of the tree, chiefly from the beginning of August to the end of October [cf. *R.A.E.*, A, xii, 462] and hatch in about 10 days. The larva immediately bores under the bark, eating a broad area of cambium near the surface. After 1-2 months it bores into the wood. Before pupation it turns back so as to pupate near the opening, the pupal stage lasting two or three weeks. The empty pupal cases remain in the opening and can be seen protruding in the autumn.

Olive trees are attacked from the ground level up to a height of 10 ft., 35 per cent. of the holes occurring within the first 2 ft. from the ground. On apple and pear twigs the galleries naturally run vertically and so far as has been noticed always upwards, but on the trunks of olive trees they are very irregular, running up and down and in many cases widening out into large feeding areas. The native trees are better able to withstand the injury than the imported varieties, and olive trees are more resistant than young apple and pear trees. The danger of the attack on the former lies in the cumulative injury year after year, the damage to the technical value of the wood being only of secondary importance in Palestine. The destruction of the larvae by inserting a wire in the galleries [*loc. cit.*] is laborious and costly, and in the case of irregular galleries not always successful. Recent experiments with paradichlorobenzene and with calcium cyanide have given very satisfactory results. The entrance holes are slightly opened with a wire and a little of the material (0.1-0.2 gm. calcium cyanide or 0.2-0.4 gm. paradichlorobenzene) is placed in the gallery, in both the upper and lower portion if possible; the hole is then sealed with non-melting tree wax.

No parasites of the moth have been observed in Palestine, but a certain number are killed by birds. The pest may occasionally be considerably reduced in olives by the exudation of gum; the larval death rate from this cause amounted to 50-70 per cent. in 1925 and about 20 per cent. in 1926.

*Phloeotribus oleae*, F., may be considered as a secondary pest of olive trees following the attack of *Z. pyrina*.

SKAIFE (S. H.). **The Bionomics of the Bruchidae.**—*S. Afr. Jl. Sci.*, xxiii, pp. 575-588. Johannesburg, December 1926. [Recd. April 1927.]

This paper is the result of studies carried on since 1916. The bionomics of Bruchids as a whole are discussed, with particular relation to the economic importance of the species known to infest peas and beans in South Africa, a previous account of which has already been noticed [*R.A.E.*, A, vii, 257]. Under confined conditions the average number of eggs laid by females of *Bruchus pisorum*, L., was 24, *B. (Callosobruchus) chinensis*, L., 51, *B. (Acanthoscelides) obtectus*, Say, 43, and *B. quadrimaculatus*, F., 18. The eggs are usually laid on the immature fruits of the food-plant, to which they are glued with a sticky secretion, and the larvae on hatching burrow immediately into the fruit; among the exceptions are several South African species, such as *B. rufulus*, Fähr., attacking *Acacia horrida*, which lay their eggs on the ripe seeds after the pods have split open, and *B. obtectus* [*R.A.E.*, A, xv, 203], the eggs of which are dropped loosely among the seeds, in the pod or in storage, so that the larvae are only able to enter where seeds are in contact with each other or with the receptacle. In several species that infest large seeds a number of larvae can develop in a single seed, but in others only one can exist in a seed, and in the case of small seeds one larva may devour several before reaching maturity. The length of the life-cycle from egg to adult may be only 4 or 5 weeks, or as many months or even longer, according to the species and the climatic conditions. The smaller species of the genus *Bruchus* rarely take longer than three months to complete the cycle, whereas some of the larger species of *Pachymerus* (for example *P. interstinctus*, Fähr., which attacks *Acacia giraffae*) sometimes take nearly two years. In most cases the adults emerge from the seeds some months before their food-plants are in flower, but the author was unable to discover the manner in which they pass the time between emergence and oviposition, concerning which there appear to be no facts on record. Adults of *B. pisorum* and *B. rufimanus*, Boh., can live as long as 10 months without food in confinement, while adults of several indigenous species, kept alive similarly for a month or more, all died before their food-plants were in flower.

The author points out that *Spermophagus maurus*, Fähr., an indigenous species that breeds in the seeds of *Hibiscus cannabinus*, would become a pest of some importance if this plant were ever cultivated in South Africa. *S. gossypii*, Chev., attacks the seeds of wild cotton in Natal. Considerable loss would be caused to wattle-growers if a species of *Bruchus* said to destroy the seeds of *Acacia mollissima* in Australia should find its way into Natal in imported seed, and there is also a danger of the introduction of *B. rufipes*, Hbst., *B. atomarius*, L., and *B. brachialis*, Fähr., which attack vetch seeds in Europe; dead adults of one of these species, probably *B. rufipes*, were found in 1918 in imported vetch seed that had been fumigated.

*Uscana semifumipennis*, Gir. [R.A.E., A, vi, 354, etc.] appears to be the only previously recorded egg parasite of Bruchids, but 2 unnamed species have been reared by the author from the eggs of South African species. One of these, a black Chalcid, sometimes destroying 50 per cent. of the eggs of *B. versicolor*, Boh., on *Podalyria argentea*, also destroys eggs of *B. pisorum* and *B. rufimanus*, which it readily attacks in confinement, though it fails to come to maturity in them. Small red Chalcids, which emerged from Bruchid eggs found on pods of *Dichrostachys nutans* at Durban, were reared from the eggs of *B. chinensis* and *B. quadrimaculatus*. Laboratory observations of these parasites show that the life-cycle only occupies about 3 weeks in midsummer. The female is parthenogenetic, 24 parasites having been raised from an individual isolated immediately after emergence. Other parasites bred include: *Bruchocida orientalis*, Crawford, reared from larvae of *B. pisorum* and very destructive to larvae of *B. cicatricosus*, Fähr., in pods of *Crotalaria capensis* and of *B. rufulus* in seeds of *Acacia horrida*; an undetermined species of *Eurytoma* destroying larvae of *B. cicatricosus* and attacking larvae of *B. pisorum* in captivity; *Entedon* spp. reared from *B. cicatricosus*; *Aplastomorpha* sp. and another Pteromalid infesting *B. pisorum*; and a species of *Tetrastichus* parasitising *B. obscurus*, infesting the seeds of *Indigofera* spp. in Natal.

A table is given showing the world distribution of the BRUCHIDAE and the number of species of each genus present in the various regions.

STOREY (H. H.). **Interspecific Cross-Transmission of Plant Virus Diseases.**—*S. Afr. Jl. Sci.*, xxiii, pp. 305–306. Johannesburg, December 1926. [Recd. April 1927.]

A summary only of this paper is given. The cross-transmission of streak disease between experimental plants has been successfully effected by the agency of the Jassid, *Balclutha mbila*, Naude, from maize to maize and from sugar cane (Uba) to sugar-cane [cf. R.A.E., A, xiii, 393]. Cross-transmission experiments from sugar-cane to maize produced a sparse form of the disease, while all attempts to transmit from maize to sugar-cane failed to give permanent infections. Streak disease, as found in the field in *Eleusine indica* and *Digitaria horizontalis*, when transferred to maize, gave forms of the disease intermediate between the normal and the sparse form. Attempts suggested by these observations, to alter experimentally the virulence of the streak virus, failed; virus from Uba cane was passed five times through successive maize plants without any visible increase in its virulence to maize. Infection by the sparse form was found to confer no immunity from infection by the normal form, either upon the maize plant or upon the insect vector. Uninfective leafhoppers, fed upon chlorotic areas developed in cane in endeavours to transmit the disease to it from maize, were able to produce the normal form of streak in uninfected maize though the sugar-cane plant recovered from the virus. Similar recoveries were observed in another variety of cane growing near diseased Uba, though this variety was never found fully diseased.

STOREY (H. H.). **Recent Researches on Plant Virus Diseases.**—*S. Afr. Jl. Sci.*, xxiii, p. 307. Johannesburg, December 1926. [Recd. April 1927.]

A summary only of this paper is given. All endeavours to transmit streak disease of maize by methods of direct inoculation, including the

injection by hypodermic syringe of juice, diluted and undiluted, from crushed infective leafhoppers, *Balclutha mbila*, Naude, failed. Experiments demonstrated a period of uninfectivity of *B. mbila* immediately following feeding upon the diseased plant. Although a definite loss of infective power was shown in some cases, it was rarely entirely lost by the leafhoppers under experiment; one of them remained infective to maize after feeding solely on healthy sugar-cane for four months. Incubation periods of the virus in the insect were determined at different temperatures. The streak virus moved down the leaf at the maximum rate of 40 cm. [11·8 in.] in three hours at 30° C. [86° F.]. By a method that limited the feeding of the leafhoppers to chosen areas of the leaf, it was demonstrated that 70 to 80 per cent. of them obtained the virus after a short period of feeding upon the chlorotic areas, while less than 15 per cent. obtained the virus from green areas, including those on diseased leaves.

NAUDE (T. J.). **Insects in Relation to Plant Disease.**—*S. Afr. Jl. Sci.*, xxiii, pp. 644-649, 10 refs. Johannesburg, December 1926. [Recd. April 1927.]

This paper summarises information, gathered from various sources already noticed, on plant diseases transmitted by insects [*R.A.E.*, A, x, 242, 544; xi, 449; xii, 40, 212; xiv, 18, 62, 163, 164, 187]. The disorders caused by insect transmission of pathogenic organisms may be divided into those where the agent is visible and those where its existence is proved experimentally but not demonstrated visually. The organism or virus may be conveyed to the plant directly by accidental or mechanical transmission by the feeding of insects that have previously fed on infected plants, or may pass through an incubation period in the insect host. It may have to pass the winter or dormant period in either the plant or the insect, or may possibly have alternate plant hosts.

OCFEMIA (G. O.). **Second Progress Report on Bunchy-top of Abaca, or Manila Hemp.**—*Phytopathology*, xvii, no. 4, pp. 255-257, 1 fig., 2 refs. Lancaster, Pa., April 1927.

When bunchy-top of Manila hemp [*Musa textilis*] in the Philippines [*R.A.E.*, A, xv, 65] is transmitted by Aphids [*Pentalonia nigronervosa*, Coq.] the leaves are smaller than normal and tend to curl up along the margin, and greenish-yellow or yellowish-white areas appear on them. When the condition is caused by other agencies, including Nematode galls on the roots, these symptoms are absent.

RAYNAUD (B.). **Notice sur deux insectes ennemis de la vanille.**—*Bull. Soc. Etudes océan.*, no. 10, pp. 39-42. Papeete (Tahiti), July 1925. [Recd. May 1927.]

A description is given of two unnamed weevils that attack vanilla plants, both Mexican and Tahitian, in Tahiti, and cause serious damage. Their life-cycle is completed in about two months. The number of generations a year is unknown, but all stages are found together. The eggs are laid in the epidermis of the twigs, in which the larvae feed. Apart from direct damage, plants attacked are rendered extremely liable to anthracosis. All attacked twigs and any dead wood in the plantation should be collected and burned.

NEWPORT (H.). **The Grasshopper Pest.**—*Terr. New Guinea Dept. Agric.*,  
Leaflet no. 49, 4 pp. [Rabaul, 1926.] [Recd. April 1927.]

The Tettigoniid, *Habetia* [*defoliaria*, Uv.], which occurs in New Britain and New Ireland, lays its eggs in the ground or any soft substance, such as rotting timber, coconut husks, etc., also in the head or crown of the coconut palm in the axils of leaves where they join the stem, and among disintegrating stipules, in fact wherever a little moisture is retained, and preferably where rubbish, such as the excreta of grasshoppers, can collect. Experiments are being carried out on its life-history and control; meanwhile the measures recommended by the Expropriation Board are quoted. To destroy the eggs, all refuse should be scorched by placing leaves over it and then burning them. During the immature stages also the pest may be killed by burning; a line of coconut leaves should be placed round the infested area and lighted first so as to form a barrier and prevent the insects from escaping as the burning proceeds towards the centre. As an alternative the infested area may be sprayed with lead arsenate (1 lb. paste, 15 gals. water, 4 lb. molasses); where animals are present a kerosene emulsion may be used.

FROGGATT (W. W.). **The Danger of introducing Timber Borers into Australia from the East and the Pacific Islands.**—*Rept. Austr. Assoc. Adv. Sci.*, xvii (1924), pp. 359–362. Sydney, 1926.

The author considers that the regulations respecting the inspection of timber coming into Sydney from the East of Asia and the Pacific should not be relaxed as there are many timber boring beetles in those regions that might easily adapt themselves to conditions in the northern coastal forests of Australia. All timber arriving in Sydney is carefully examined, infested boards are destroyed, and, in the case of infested logs, all the sapwood is cut off and burned. The beetles found in the sapwood are Scolytids, principally species of *Platypus* and *Xyleborus*, which attack the tree as soon as it is felled. *Platypus* spp. cannot live in dry wood, so that their development is necessarily rapid, the life-cycle taking only a few weeks. The smaller *Xyleborus* spp. remain working in the timber until the sap dries out, but, though they are often very numerous in logs, no foreign species would, in the author's opinion, be likely to become established in a new country. Bostrychid and Lyctid beetles are chiefly found in sawn timber, and might easily be introduced. The former bore into timber stacked for shipment, and lay their eggs in it. The latter lay their eggs in the pores of the sapwood of seasoned timber. The beetles that have been obtained from timber imported into Australia include *Xylothrips flavipes*, Ill., which has a wide range over the Philippines and the Malay Archipelago, and occurs in Madagascar, India and China; *Synoxylon anale*, Lesne, common in India, China, the Philippines and the Malay Archipelago; *Lyctus brunneus*, Steph., from the East of Asia; *Minthea* (*Lyctopholis*) *rugicollis*, Wlk., common in Java and the Malay Archipelago; and *Anobium punctatum*, DeG., chiefly from seasoned New Zealand white pine (*Podocarpus dactyloides*).

MUNGOMERY (R. W.). [Report of the Southern Assistant Entomologist.]  
—*Queensland Agric. Jl.*, xxvii, pt. 3, pp. 176–177. Brisbane,  
1st March 1927.

The adults of *P[seudoholophylla] furfuracea*, Burm., began to emerge about the middle of December in Southern Queensland, when

the first heavy rains fell, and the flight period lasted for about a week. Mating takes place almost immediately after emergence, usually on the ground, and may last for 45 minutes, during which time the paired beetles are often attacked and killed by small ants of many species. From the numerous instances in which this was observed it is thought that the ants must play an appreciable part in checking the increase of the pest.

Egg-laying began on 22nd December. The eggs are laid singly in the soil, each enclosed in a small pellet of earth. Each female lays only one batch of eggs, over a period of several days, the total number of eggs found in dissected females ranging from 12 to 45, with an average of 30. The eggs, which increase in size after laying, hatched in 19 days at an average shade temperature of 77° F.

JARVIS (E.). **Cane Pest Combat and Control.**—*Queensland Agric. Jl.*, xxvii, pt. 3, pp. 179–182, 1 pl. Brisbane, 1st March 1927.

The first emergence of *Lepidoderma albohirtum*, Waterh. (grey-back cane-beetle) at Meringa took place from 15th to 23rd December, during which period the rainfall amounted to 3.14 inches; further heavy showers kept the ground moist and in a condition ideal for egg-laying, which began in the first week in January. In 1915, 1921 and 1923 laboratory experiments with arsenicals applied to the food-plants of the adults of *L. albohirtum* were made; beetles died 9 days after feeding on leaves sprayed with 2 lb. lead arsenate in 50 gals. water, and 4–7 days after feeding on leaves sprayed with 1 lb. Paris green and 1½ lb. lime in 8 gals. water; when the arsenicals were applied to the leaves as dusts, lead arsenate killed 10 per cent. of the beetles 12 hours after feeding, and Paris green killed 50 per cent. in about 24 hours. In December 1926 further laboratory experiments were carried out, beetles being confined singly with fig leaves sprayed with 2 lb. lead arsenate in 10 gals. water, a much stronger solution than any used previously. Of 26 beetles 11 died within 24 hours, 10 died in 4 days and 3 in 10 days. Only 4 beetles out of 25 in control cages fed on the untreated leaves; one lived for 14 days, the other three longer. These results are considered sufficiently promising to warrant field trials with trap trees, which should be sprayed as soon as possible after the appearance of the beetles, as most of the feeding takes place in the first 5–6 days after emergence. *Ficus pilosa* and *F. nesophila*, which invariably attract large numbers of beetles, could be planted on headlands, or among the cane at intervals of a few hundred yards, and should be pruned occasionally to keep the heads low and spreading; tall trees attractive to the beetles, such as *Eucalyptus tessellaris* (Moreton Bay ash), should be destroyed.

Experimental plots in a district infested with *Mastotermes darwiniensis*, Frogg., planted with sugar-cane in August, were examined in December, and it was found that dipping the ends of the sets in dehydrated tar before planting had failed to protect them, as the termites entered the treated ends and also bored through the rind between the nodes; soil fumigation with paradichlorobenzene gave little control, but the results in this case were inconclusive, owing to the irregular distribution of the termite attack.

JARVIS (E.). **Entomological Hints to Canegrowers.**—*Queensland Agric. Jl.*, xxvii, pt. 3, pp. 182-183. Brisbane, 1st March 1927.

During the first part of February larvae of the grey-back cockchafer [*Lepidoderma albohirtum*, Waterh.] are in the first instar, and advantage should be taken of the first opportunity of moving the surface soil between rows of young shoots of ratoon or plant cane considered likely to be infested; in well-drained soils this can usually be done safely 2-3 days after heavy rain, when the young larvae come up to within an inch or two of the surface and feed on the fibrous roots at a distance of 6-8 inches from the centre of the stools, probably attracted by the warmer and somewhat drier conditions in the upper layer of soil. Disturbing the soil as close as possible to the cane rows brings some of the larvae to the surface and dislodges the remainder from their tunnels so that they are liable to fall an easy prey to *Pheidole megacephala*, F., and other ants.

FROGGATT (J. L.). **The Banana Thrips** (*Anaphothrips signipennis* Bagnall).—*Queensland Agric. Jl.*, xxvii, pt. 3, pp. 186-190, 2 pls., 1 ref. Brisbane, 1st March 1927.

More detailed accounts of the bionomics of *Anaphothrips signipennis*, Bagn. (banana thrips) and its control with calcium cyanide have been noticed previously [*R.A.E.*, A, xiii, 452; xv, 213]. Emphasis is laid on the importance of cultural measures in the control of this pest, which is most injurious from October to March in Queensland. When the bunch has been cut from a plant, the pseudostem should be cut off as close to the ground as possible and cut into three or four pieces, each of which should be split into two and left exposed to the sun and afterwards chipped in or burnt; all tip fruits and bud ends should be cut off and destroyed; these parts of the plant would otherwise provide shelter and breeding-places for the thrips. Suckers for planting should be obtained from uninfested plantations, but if this is not possible, the bulbs should be scraped or lightly pared, the tops should be cut off well down, and any trash around the crown of the corm should be removed.

WELLS (W. G.). **Callide Cotton Research Station, Biloela. Annual Report for the Year ending 30th June, 1926.**—*Queensland Agric. Jl.*, xxvii, pt. 3, pp. 191-212, 2 maps, 3 figs., 1 ref. Brisbane, 1st March 1927.

This report is slightly fuller than one noticed from another source [*R.A.E.*, A, xv, 195], but the section on insect pests contains no additional information.

**Quarantine Proclamation, no. 169.**—*Commonw. Australia Gaz.*, no. 40, reprint, 1 p. Melbourne, 28th April 1927.

The importation into Australia of peanut plants (*Arachis hypogaea*), including the seed, is prohibited, except by permission of the Minister for Health.

NEWMAN (L. J.). **Seasonable Hints.**—*Jl. Dept. Agric. W. Australia*, iv, no. 1, pp. 78–82, 5 figs. Perth, W. A., March 1927.

*Penthaleus destructor*, Tuck. (red-legged earth mite), which remains dormant in the egg stage during the dry season [*R.A.E.*, A, xi, 571; xiv, 50], appears in a sudden swarm with the advent of the rains in April or May in Western Australia. There are at least three generations during the wet season, a succession of broods occurring every 35–40 days. As the appearance of the mite synchronises with the germination of the seeds, much damage is done to young plants such as clover, particularly subterranean clover [*Trifolium subterraneum*], and other early winter fodder plants. The planting of burr clover [*Medicago denticulata*], which is less readily attacked, might secure, in suitable localities, a supply of early fodder until the more susceptible varieties can outgrow the attack, which they are usually able to do later in the spring. Control may be effected by ploughing 7–10 days after the appearance of the first mites, this interval being allowed to elapse in order to permit all the eggs to hatch. Both with this method and with the use of insecticides it is important that treatment should be applied before a second batch of eggs has been laid. As the eggs are resistant to most insecticides, further treatments, if necessary, should be applied at intervals of 35 days, the aim being to destroy the mites before the egg-laying stage is reached. The importance of clean cultivation is insisted upon [*R.A.E.*, A, xi, 571]. Similar damage is done by *Smynturus viridis*, L. (lucerne flea), which attacks leguminous plants and to a less degree other crops [*R.A.E.*, A, xi, 153]. As it is a powerful jumper it can spread rapidly. It is known to follow water-courses, and owing to its ability to float, is sometimes carried long distances from the original breeding ground by running water. Crops grown on weed-free fallow, the surroundings of which have been cleared of succulent growths such as Cape weed (*Cryptostemma calendulaceum*), will be free from these Collembola. Control measures for use on limited areas, which must be applied promptly on the first appearance of the pest, include : a spray of 1 pt. 40 per cent. nicotine sulphate, 4 lb. soap dissolved by boiling and 80 gals. water ; a mixture of 8 oz. soap, 8 tablespoons of turpentine and 4 gals. water, applied hot ; a spray of 3 lb. lead arsenate to 40 gals. water ; a dust consisting of 1 lb. 15 per cent. carbolic powder to 3 lb. superphosphate ; and tarred screens or shallow trays drawn up and down an infested field.

NEWMAN (L. J.). **Poison Dusting for Locusts.**—*Jl. Dept. Agric. W. Australia*, iv, no. 1, pp. 101–104, 2 figs. Perth, W. A., March 1927.

Owing to the successful employment of sprays and baits [*R.A.E.*, A, xiv, 204], *Chortoicetes terminifera*, Wlk., was much less prevalent in Western Australia during the past season. It is nevertheless important that vigilance should not be relaxed, as it is unlikely that the locust will ever be entirely exterminated. A cage experiment made to test on *C. terminifera* the method adopted by Mally in South Africa [*R.A.E.*, A, xi, 251], which demonstrated that poison dust kills by absorption through the skin as well as by ingestion through the mouth, resulted in death of all locusts 24 hours after dusting with powdered sodium arsenite mixed with an inert diluent, 1 : 16. A field experiment, using the same dust at the rate of 5 lb. an acre, also gave satisfactory results.

NEWMAN (L. J.). **Report of Economic Entomologist.**—*W. Australia Dept. Agric. Ann. Repts. 1924-25 & 1925-26*, pp. 22-24 & 29-31. Perth, W.A., 1925 & 1926. [Recd. May 1927.]

The bulk of the information contained in these reports has already been noticed from other sources [*R.A.E.*, A, xii, 411 ; xiii, 114, etc.]. Among parasites widely distributed, *Coccophagus* sp. has proved useful against the vine scale, *Lecanium persicae*, F. (*cymbiformis*, Targ.). Considerable damage was done by *Heliothis (Chloridea) obsoleta*, F., to young fruits and leguminous plants. A phenomenal outbreak of *Macrosiphum (Siphonophora) citrifolii*, Ashm. (black orange aphid) occurred in hot weather in December-January, when this Aphid is usually scarce, in an orchard that had been sprayed with a copper sulphate mixture in October. It was concluded that an entomophagous fungus that had been holding the Aphid in check had been destroyed by the spray.

Insect pests were particularly abundant in 1925-26, the most numerous including : the fruit-fly, *Ceratitis capitata*, Wied., which was reared for the first time from mulberry, *Nezara viridula*, L. (green tomato bug), *Nysius vinitor* Bergr. (Rutherglen bug), *Thrips tabaci*, Lind., and the army-worm, *Persectania ewingi*, Westw. Much damage was caused to vines, fruit trees and gardens by swarms of locusts [*Chortoicetes terminifera*, Wlk.], which appeared in November and became winged in February and March. This is the first recorded occurrence of the insect at this season. A Chalcid parasite, *Aphelinus diaspidis*, How., that has effectively controlled the red scale, *Chrysomphalus aurantii*, Mask., has also been numerous. The potato moth, *Phthorimaea operculella*, Zell., and the cabbage moth, *Plutella maculipennis*, Curt. (*cruciferarum*, Zell.) were both troublesome in the late summer.

JARVIS (E.). **Cane Pest Combat and Control.**—*Queensland Agric. Jl.*, xxvii, pt. 4, pp. 270-271. Brisbane, 1st April 1927.

Injury to young maize plants by the larvae of the Eumolpid, *Rhyparida morosa*, Jac., has occurred in one district, the roots and base of the stems being attacked ; the appearance of the damage resembles that on young shoots of sugar-cane. The adults occasionally occur in very large numbers on the flower spikes of grasses and on other plants [*R.A.E.*, A, viii, 411] over restricted areas of uncultivated land ; when noticed in considerable numbers on headlands they can be collected by shaking them into pans of water with a film of kerosene. The larvae can be controlled by soil fumigation with paradichlorobenzene or carbon bisulphide, but for the latter the soil must not be too wet [*R.A.E.*, A, xiii, 641] ; even in well-drained soils treatments should not be made for 3 or 4 days after heavy rain. These two fumigants are also the most effective against the larvae of *Lepidoderma albohirtum*, Waterh. Carbon bisulphide should be applied with an injector at the rate of about  $\frac{1}{2}$  oz. at intervals of 12-15 ins. on both sides of the cane rows, about 3 ins. from the centre of the stools. In laboratory experiments with calcium cyanide flakes for the destruction of eggs of *L. albohirtum* it was found that 10 grain doses placed in damp soil about 2 ins. above the eggs gave 100 per cent. control in 24 hours.

Laboratory experiments with poison baits for the control of *Mastotermes darwiniensis*, Frogg., were made, the cheapest, simplest and most

effective being pieces of split cane soaked in either a saturated or a 10 per cent. solution of sodium arsenite, which killed all the termites in 24 hours.

MUNGOMERY (R. W.). [Report of the Southern Assistant Entomologist.] — *Queensland Agric. Jl.*, xxvii, pt. 4, pp. 272–273. Brisbane, 1st April 1927.

The Melolonthid, formerly thought to be *Lepidota grata*, Blackb., that is a serious pest of sugar-cane in Southern Queensland [*R.A.E.*, A, xii, 359; xiii, 115; xiv, 331, 366; xv, 29] has been identified by Mr. A. M. Lea as *L. trichosterna*, Lea. The rainfall in December and January was exceptionally heavy, and in the latter part of January low-lying fields were water-logged, and in some cases completely submerged, for more than a fortnight; in these fields many third stage larvae of *P[seudoholophylla] furfuracea*, Burm., were found to be dead, although some that were apparently lifeless recovered when placed in dry soil, and it is probable that the mortality among the first stage larvae, which would have been hatching at the time, was greater. Heavy rains are particularly destructive to Lamellicorn larvae in friable soil in low-lying or badly drained fields in the summer, as they are then feeding near the surface, and respiratory activity is at its maximum, so that they are asphyxiated before they can reach the less permeable soil below.

JARVIS (E.). **Entomological Hints to Canegrowers.**—*Queensland Agric. Jl.*, xxvii, pt. 4, pp. 275–276. Brisbane, 1st April 1927.

The usual methods of controlling outbreaks of army-worms, *Cirphis unipuncta*, Haw., *C. loreyi*, Dup., and *Laphygma exempta*, Wlk., are described [*R.A.E.*, A, xiv, 330; xv, 242]. Holes about 1 foot square and 2–3 feet deep should be made at intervals of 15–20 feet in the bottom of a trench made to check the advance of the larvae, which, in travelling along the furrow in search of a way of escape, will fall into them; when these holes are filled with larvae a little kerosene is poured on to them and they are removed with a shovel. The use of poisoned baits between rows of sugar-cane is chiefly directed against *L. exempta*, the larvae of which travel from row to row even in hot sunshine, but it is best to apply the baits towards sunset, as they then remain moist longer and serve to control also the larvae of *C. unipuncta* and *C. loreyi*, which feed mainly at night.

[MUNGOMERY (R. W.).] **Cane-beetles in the Isis District.**—*Queensland Agric. Jl.*, xxvii, pt. 4, pp. 278–279. Brisbane, 1st April 1927.

In the Isis District considerable sums of money have been spent on the collection of adults of *Pseudoholophylla furfuracea*, Burm. [*R.A.E.*, A, xiv, 331], most of the beetles caught being attracted to light. Samples of the beetles collected in this way in various localities during December 1926 were examined by the author, and he found that less than 1 per cent. were females, from which it appears that the females are not attracted to light, so that the practice is almost useless as a control measure, and it is suggested that the money hitherto devoted to it should in future be used for the purchase of soil fumigants for controlling the larvae.

SMITH (J. H.). **Life History Notes on the Rutherglen Bug.**—*Queensland Agric. Jl.*, xxvii, pt. 4, pp. 285-302, 2 pls., 2 refs. Brisbane, 1st April 1927.

A severe outbreak of a Lygaeid, *Nysius* sp. (Rutherglen bug), occurred in Southern Queensland in the latter part of 1926 [*R.A.E.*, A, xv, 132], and field and laboratory studies of the life-history were made from October to December. Eggs were found on two weeds of the order Compositae, *Gnaphalium purpureum* (cud-weed) and *Sonchus oleraceus* (sow-thistle), and are probably laid also on similar plants, such as *Ageratum conyzoides*, on the flower heads of which first and second instar nymphs were found; on a few occasions eggs were found on *Imperata arundinacea* (blady grass), attached singly to the feathery awns of the seeds in the mature panicles. *G. purpureum*, which appears to be most favoured for egg-laying, is more or less covered with fine down, in which the eggs are laid, usually singly, and usually where the down is thickest. *S. oleraceus* is almost glabrous, and on it the eggs are laid in groups in the pappus of the mature flowers, a position never observed with *G. purpureum*. In the laboratory eggs were laid freely in cotton wool; the process is described. The oviposition period of individual females varied from 13 to 25 days, the total number of eggs laid from 134 to 435, and the maximum in one day from 24 to 45.

Two successive generations of bugs were reared in the laboratory on *G. purpureum* and the immature flower heads of *S. oleraceus*, the latter being lacerated to provide a ready flow of sap. The normal periods of development were: incubation, 6 days; first instar, 5 days; second, third and fourth instars, 3-4 days each; and fifth instar, 5 days; total, about 4 weeks. Most of the bugs became adult at the fifth moult, but a few did so at the fourth. Males were in excess of females by about 25 per cent. Nymphs of the first two instars did not wander much from the place of hatching, although able to do so, but those of the third and later instars wandered freely over the soil in search of fresh food-plants, and occurred in large numbers on *Portulaca oleracea*.

Injury to cultivated plants, almost all kinds of which are subject to attack, has been due to the adults in all cases so far observed. The nature of the injury to potatoes, beetroot and *Citrus* is described. With potatoes the terminal shoots are usually attacked first, and the loss of sap causes them to wilt; if the plant is heavily infested in the early stages of its development, lateral shoots are produced to replace the foliage lost and few tubers are formed, but if a heavy infestation does not occur until the tubers have formed, fresh foliage is only produced sparingly, and the tubers remain small. With beetroot, wilting is produced by the feeding of large numbers of bugs on the leaf bases at the crown of the root, the development of which is checked. Both the leaves and the newly-set fruit of *Citrus* are attacked, the injury to the leaves being relatively unimportant; in one orchard all the young fruits examined had been punctured repeatedly by the bugs; in some cases callus had formed over punctures that were close together, leaving a blemish that would probably persist in the mature fruit, while sap oozed from the newly formed punctures; the ultimate effect of the injury must be the production of small, unevenly developed fruit, deficient in juice.

Full descriptions of all stages and tables giving details of the life-history studies are appended.

ATKINSON (D. J.). *Hoplocerambyx spinicornis*—An important Pest of Sal.—*Forest Res. Inst., Dehra Dun, U.P.*, Forest Bull. 70 (1926), 14 pp., 5 pls., 2 refs. Calcutta, Govt. India Central Pubn. Br., 1927. Price As. 15 or 1s. 6d.

The Longicorn, *Hoplocerambyx spinicornis*, Newm. (sal heartwood borer), is one of the most serious forest pests in India. Outbreaks have occurred recently in both the United Provinces and the Central Provinces, the losses among forests of pure sal [*Shorea robusta*] in two Divisions of the latter in one year amounting to over £110,000. More than 50 per cent. of the ruined trees observed exceeded 4 feet in girth and would therefore have been marketable for construction of railway sleepers.

The beetles begin to emerge from the trees with the onset of the rains, and continue to do so until about September, the maximum emergence being in July. The author considers that it is most probably a chemotropic reaction analogous to a sense of smell that attracts the beetle to a sal tree; recently felled or wounded trees would thus be more attractive owing to the odour of the exposed sap. There does not seem any satisfactory evidence to prove the generally accepted theory that beetles confine their attacks to unhealthy trees and only under pressure of numbers attack healthy ones; if this were so, there would be no heavy attacks in healthy forests at all, or, if there were an attack, it would be expected chiefly on suppressed or damaged trees. As a matter of fact, the beetles seem to prefer the biggest and healthiest trees, frequently choosing those with their heads well above the surrounding foliage. Attack at the crown of a tree is quite common, and it is obvious that the beetle flies fairly frequently at the height of the crowns, that is, above the general mass of surrounding foliage. Adults have been taken in numbers four miles from the nearest sal forests on a windy night; they were obviously blown on the wind, but must have been flying about above the jungle canopy. This probably explains the method of spread to isolated patches of sal.

The eggs are deposited singly, some distance apart, in crevices in the bark, the average number laid by one female in the insectary being 250. The larvae hatch in 4 or 5 days and burrow towards the sapwood, where most of the feeding is done. The tree immediately pours out a stream of resinous sap, which forms the obvious and familiar yellow "ral" seen in most sal forests. In the case of a first attack this outflow of resin generally drowns the young larvae, and, if not attacked again, the tree will rapidly recover from the injury. A living larva has never been found by the author under a splash of ral. But if subsequent attacks occur, the tree, weakened by the outflow of resin, is unable to kill off more larvae and eventually succumbs. The appearance of ral is generally the first sign of the activities of *H. spinicornis*. The larval mine is an irregular tunnel grooving both bark and sapwood, or the sapwood only, and increasing in width with the size of the larva. The feeding period generally lasts from 4 to 7 months, and when fully fed, the larva cuts out a chamber in the bark and sapwood, which it clears of frass by means of a hole opening to the exterior, and then bores down into the heartwood, usually in a sloping direction. This mine is quite different from the feeding gallery, the wood being torn off in splinters, and most of it, together with that from the pupal chamber in which the mine ends, is pushed up by the larva into the cleared chamber in the sapwood, a certain amount of it going out of the tree and falling to the ground, so that a heavily attacked

tree may show a mound as much as 2 ft. deep all round its base. The pupal chamber is in the longitudinal axis of the tree at the bottom of the heartwood gallery and the operculum is formed over the mouth [R.A.E., A. viii, 101]. The larva then remains quiescent for several months, after which it transforms into a pupa (in northern India, about mid-May). The pupal stage lasts from 2 to 3 weeks according to insectary studies, after which the pupal pellicle is shed and the adult emerges. It remains in the sealed chamber for about another month, until chitination is complete, and then breaks through the operculum, proceeds up the heartwood gallery and emerges through a large hole gnawed direct through the outer bark.

The beetle is probably present endemically in most sal forests, breeding chiefly in felled and damaged material, and it is likely that a certain combination of factors, both climatic and biological, are necessary before an epidemic can occur. The possibility of preventing epidemics is considered to lie chiefly in the instruction of subordinates in the symptoms of attack by *H. spinicornis* and in the careful patrolling of forests and early report of the presence of ral and of dead and dying trees. Those containing living larvae should all be felled and burned, but this should only be done when the tree shows the ejection of wood dust and not merely on the evidence of ral. Burning must be thorough; even severe scorching has failed to kill the larvae or to prevent oviposition. The only satisfactory method is to fell and log the tree, piling the logs up in criss-cross fashion over a heap of dry material. This, however, is an expensive process and emphasises the necessity for controlling attacks at the onset. As the beetles apparently prefer recently felled trees, the date of felling becomes important, and, although experiments cannot as yet be considered conclusive, it appears justifiable to recommend that fellings should be done so far as possible in the earlier part of the working season. Where work during the rains is possible, as many trees as convenient might be felled during the early part of the rains, to act as traps to attract the ovipositing females. The portions of these trees intended for conversion would then have to be barked before the larvae could enter the heartwood and the refuse burnt before the following rains. If an attack has reached the epidemic stage and green trees are being attacked and killed in large numbers, these trees must be removed and the infested material destroyed. The usual procedure of enumerating trees one year for disposal in the next is thus quite out of the question; the whole process of enumerating, felling and disposal must be completed within 3 or 4 months. Where the size of the area precludes the possibility of dealing with the situation in a single season, the second year's work must include reinspection of the area dealt with in the previous year, as reinfestation is sure to occur from adjoining areas. The cost of dealing with infested trees in the manner recommended is briefly discussed.

BENSKIN (E.). *Hoplocerambyx*.—*Indian Forester*, liii, no. 4, pp. 194-200. Allahabad, April 1927.

In the Kalagarh Division, United Provinces, remedial measures against *Hoplocerambyx* [*spinicornis*, Newm.] are based on the removal of the wood while the larvae are still embedded in the tissue and before the beetles emerge. The difficulty is to compel purchasers of timber to collect the litter or burn it. The author suggests that the best solution

of the problem of infestation is better forest sanitation and the adoption of the following protective measures. Trees should not be maintained after maturity, which is probably at about 4 ft. girth, as unhealthy trees are thought to be preferred. Litter should be cleared up at once, or else left with a few girdled trees as a trap and completely burnt in the following season. Frost, which is a cause of much unsound timber, is enhanced in its effect by a dense tree crop, which retards air currents. The importance of the prompt removal of unsound stock cannot be too much emphasised. The burning of refuse has proved a positive danger in encouraging the spread of the beetle, as the heat generated by the fires may weaken the trees within a radius of as much as thirty yards.

BEESON (C. F. C.). **Further Observations on *Hoplocerambyx*.**—*Indian Forester*, liii, no. 4, pp. 200–206. Allahabad, April 1927.

In the Central Provinces, where the recent epidemic of *Hoplocerambyx* [*spiniornis*, Newm.] has involved some 5 or 6 million trees in one Division alone, it is found that the beetle attacks for preference the healthiest and largest trees, particularly those with crowns standing well above the surrounding growth. Divergent views have been expressed as to the effects of fires and with regard to the condition of trees chosen for attack [see preceding papers], and there is probably some truth in each, so that the problem is essentially a complex one. The author has compiled tables showing the percentage of trees attacked in each class, and also the relative intensity of attack. The figures show that at the beginning of an epidemic the attack on the larger trees is relatively heavier than on the smaller ones; this agrees with findings recently recorded [*R.A.E.*, A, xv, 354]. At the conclusion of the attack, however, the intensity of infestation is the same throughout the crop. Other factors, among which rainfall is one, further complicate the question. The power of resistance of sal to attack by *H. spiniornis* is highly developed, and most healthy trees can protect themselves against all but a mass attack. Moreover, larvae are able to kill only that part of the tree in which they concentrate above a certain strength; below that strength, even in other parts of the same tree, the larvae will be killed. With regard to fires, the author is of opinion that heat does not directly injure trees beyond a few yards' distance, and, far from considering the burning of refuse as dangerous in encouraging the spread of the beetle [see preceding paper], he regards it as a useful means of restricting its spread in conjunction with trap-trees. The labour supply under modern conditions is never sufficient to carry out control measures on an ideal scale and wipe out an epidemic in one year; it is therefore essential to make very careful selection of the trees that require treatment. Unfortunately the efficiency of remedies has been much reduced by faulty selection of trees; such selection should only be made under careful supervision, in order to destroy the largest number of borers for the labour and expenditure involved.

ANSTEAD (R. D.). **Entomology.**—*Rept. Dept. Agric. Madras 1925–26*, pp. 33–34 & 43–44, 1 pl. Madras, 1926. [Recd. May 1927.]

Observations on *Schoenobius* [*incertellus*, Wlk.] (paddy-stem borer) show that it remains either in the stubble or in the stems of wild rice during the hot season, and that in years of rainfall in summer large numbers survive to infest the new crop. For oviposition the moths

select a crop that has just established itself after transplantation, which suggests that if transplanting were delayed until the weather cleared and only the smaller broods were emerging, a partial control would be obtained.

*Nephantis serinopa*, Meyr. (coconut caterpillar) has been introduced on the west coast and has spread continuously throughout the year along railways, roads and waterways, chiefly owing to the impossibility of preventing the use of coconut leaves, which may be infested with caterpillars, for covering consignments of tiles, fish baskets, etc. In dealing with this pest the leaves are first removed and burnt, and later parasites are introduced. Two of these have become established in one locality and are slowly spreading. In order to hasten their distribution, parasitised material is transported from one place to another and stored in cages that allow the parasites to escape but retain the moths. Other parasites, including some from Cochin, have been bred and released in badly infested areas. On the whole the situation has been improved by these measures, but the pest is spreading into new localities owing to the careless transport of infested material. It is suggested that parasites should be bred on a large enough scale to allow their liberation in sufficient numbers to keep the pest in check throughout the district, as is the case in other countries where it is of a sporadic character.

SUBRAMANYAM (C. K.). **A Note on the Life History of *Cryptorrhynchus mangiferae*, Fab.**—*Madras Agric. Dept. Yrbk. 1925*, pp. 29–36, 4 figs. Madras, 1926. [Recd. May 1927.]

Investigations into the cause of an abnormal fall of mango fruits in a village in Madras revealed the presence of *Cryptorrhynchus mangiferae*, F. (mango seed weevil). The process of oviposition is described. The eggs are laid singly on the epicarp, as many as 12–36 being observed on a single fruit, though it is evident that one stone could not support such a large number of larvae. Oviposition may take place over a period of 1–3 weeks, beginning on the tender fruits and ceasing when the fruit is half grown and the seed coat becomes fibrous. It takes 7 days for the egg to hatch and the grub to tunnel through the pulp or mesocarp and reach the seed coat, on which it first feeds. It then proceeds to eat the cotyledons and pupates along their concave side or occasionally between them. The pupal stage lasts 7 days, and the total life-cycle occupies approximately 50 days. There appears to be only one brood each year. The adults, which continue to emerge over a long period, generally make their exit through a hole on the concave edge of the stone where the fibres are attached, this being the weakest region in the endocarp. They have been found feeding on the leaves of tender mango shoots in March and April. The various stages are briefly described. Details are given of the varieties of mango attacked. The nature of the injury is described; the principal damage is done to the seed since all traces of the tunnelling of the early stage larvae in the pulp disappear with the growth of the mango.

KUNHI KANNAN (K.). **Entomological Section.**—*Jl. Mysore Agric. & Exptl. Union*, viii, no. 1, pp. 11–17, 2 pls. Bangalore, 1926. [Recd. April 1927.]

The chief pests that occur in Mysore are enumerated with an account of simple remedies within the means of the poorest cultivators. Except

on the most valuable crops an alternative to spraying is always sought. *Amsacta albistriga*, Wlk., is a serious pest of most dry crops in Mysore, the caterpillars pupating in the fields beyond the reach of ploughs and the moths (of which one female may produce 1,000 larvae) emerging after every shower during the first six weeks of the monsoon. Hand collection and destruction of the moths is advocated. *Nymphula depunctalis*, Gn. (rice case-worm) and a Rutelid beetle in sugar-cane and rice are amphibious, and a successful remedy has been found in a piece of rag soaked in kerosene placed at the spot where water enters the rice-field. The kerosene film thus produced on the water kills the larvae. The larvae of the ground beetle, *Gonocephalum hoffmannseggi*, Stev., feed on the roots of cereals and potatoes; fresh roots of grasses pulled up and placed about the field attract the adults, and they can then be destroyed. Moths of *Diatraea* spp. (sugar-cane borers) can be successfully attracted to small heaps of cane trash in the field. Adults of *Chelidonium cinctum*, Guér. (lime tree borer) emerge in May and oviposit in the forks of small twigs, which the larvae girdle. The remedy is to break off the girdled twigs sharply by means of a forked stick. The orange borer in Coorg has been found to be identical with this species. Both *Hieroglyphus banian*, F. (rice grasshopper) and *Colemania sphenarioides*, Bol. (jola grasshopper) can be caught by means of bags swept over the crop. *Contarinia andropogonis*, Felt (jola ear-head fly) oviposits on the developing heads of jola [*Sorghum*]. Two or three yards of cloth covered with an adhesive is carried like a canopy over the crop, which is shaken, so that the adults fly up and are caught. *Coccus viridis colemani*, Kann., is a serious pest of coffee in years of drought, but can be controlled by spraying with fish-oil, resin and soap when it begins to multiply. *Xylotrechus quadripes*, Chev. (coffee borer) is generally controlled by hand collection of the adults, which emerge from October to December.

KUNHI KANNAN (K.). [Reports of the Entomologist.]—*Ann. Repts. Agric. Dept. Mysore, 1924-25 & 1925-26*, pt. ii, pp. 9-12 & 11-14. [Bangalore] 1926 & 1927.

In addition to the pests dealt with in previous reports [see preceding paper and *R.A.E.*, A, xiii, 646], *Idiocerus* spp. (mango hoppers) have been the subject of experiments, which indicate that in certain conditions the removal of heavily infested flowers should be resorted to on small areas as a method of saving later blossoms from attack. The caterpillars of *Eupterote* sp. on shade trees were successfully controlled on one coffee estate by spraying the groups of caterpillars with kerosene from a syringe. This pest did not appear on cardamoms during 1925-26. A serious outbreak of *Epacromia tamulus*, F. (*dorsalis*, Thnbg.) was reported from two districts, where seasonal conditions compelled the grasshoppers to attack crops in the absence of their normal grass food. Poison baits failed to control them, and bagging was resorted to.

HUTSON (J. C.). Recent Work on Some Pests of Economic Crops.—*Trop. Agriculturist*, lxxviii, no. 4, pp. 220-228, 2 refs. Peradeniya, April 1927.

Brief notes are given on various pests of economic crops, such as tea, green manure and shade trees, etc., in Ceylon, with references in

most cases to indicate where more extensive information on the subject may be obtained. The papers referred to have already been noticed.

LIGHT (S. S.). **Mites as Pests of the Tea Plant.**—*Trop. Agriculturist*, lxviii, no. 4, pp. 229-238. Peradeniya, April 1927.

The mites attacking tea are discussed, with particular reference to those occurring in Ceylon, namely *Eriophyes carinatus*, Green (purple mite), *Tarsonemus translucens*, Green (yellow mite), *Brevipalpus (Tenuipalpus) obovatus*, Donn. (scarlet mite) and *Tetranychus bioculatus*, W.M. (red spider). A table is given showing those features of the injury by which the planter may determine which of these species is responsible for damage encountered in the field.

*E. carinatus* usually confines its attack to the older leaves, which show in consequence a coppery or purplish discolouration. The mites may be found on both sides of the leaf, but show a marked preference for the upper surface, especially the midrib and the margins. The eggs have not so far been recorded, and it is thought that the mite may be parthenogenetic. Although possibly the least harmful of the Ceylon species, it is one of the commonest. *Tarsonemus translucens* is only found on the flush and the leaves immediately below. It occurs on both sides of the leaf, though mainly on the lower surface, where the mites may be found, in severe attacks, clustered together with their eggs. *B. obovatus* also attacks the flush and younger leaves and is seldom found on the older growth. The eggs are laid in clusters, generally at the base of the leaf or in scars on its surface. At the present time it is the most destructive of the native species and an important pest of tea. It has also been recorded on camphor, *Grevillea* and orange in Ceylon. The characters distinguishing it from *Tetranychus bioculatus* are briefly enumerated. The latter attacks only the older leaves, feeding on the upper surface, the injury frequently being followed by fungous diseases. It is frequently found in association with *B. obovatus*, the former occupying the upper and the latter the lower surface of the leaf. Unlike the other three species, *T. bioculatus* is seldom found over extended areas, but occurs in small patches in different parts of an estate. This species has also been taken in Ceylon on camphor, *Grevillea*, *Aristolochia* and *Eugenia jambolana*. In Ceylon it appears that all species are liable to occur wherever tea is grown, since they have been recorded from estates at an altitude of over 6,000 ft. down to sea level, though the dry, eastern side of the island, which receives only one monsoon a year, is more favourable to their occurrence. Brief notes are given on the history, distribution and food-plants of these and allied species, such as *Eriophyes theae*, Watt, in other countries.

Distribution may take place by the mites passing directly from bush to bush either across the intervening soil or from shoots in contact with each other, but the fact that infested bushes are scattered here and there in the fields suggests that the mites are probably carried on fallen leaves by the wind. It was observed that on leaves that had been recently picked or that were about to fall, an unusually large number of eggs had been laid, thus insuring dispersal of the mite in that state best able to withstand the adverse conditions to which the leaf may be subjected before coming to rest beneath the shelter of another bush, upon which the young mites may crawl. It is considered that the distribution of mites on the clothing of workers is of minor importance.

Mites are controlled to a certain extent by rainfall, the main outbreaks corresponding roughly with the periods of drought. *E. carinatus* and *T. bioculatus*, which live on the upper surface of the leaves, are easily washed off; the other species are not affected to the same extent, *Tarsonemus translucens* especially being protected by the hairs on the young leaves. This control may, however, be of a temporary nature, since after a short drought the mites reappear on the bushes. It has been shown in the case of *Tetranychus bimaculatus*, Harvey (and the same probably applies to *T. bioculatus*) that the mites are not always killed when washed off by rainfall, but may have to be submerged for nine hours before death occurs. The peculiar persistence and wide distribution of these mites are also partly explained by the polyphagous habits of some of the species and by the evidence that they are, as a group, remarkably resistant to extremes of temperature.

Intensive cultivation and consistent manuring make the bushes more resistant to attack by mites. This is partly due to the rate at which flushing takes place, the ill effects being thrown off by the vigour of growth, and partly to the fact that the larger leaves formed by healthy bushes are often unsuitable for the feeding of mites. Efficient drainage is an important factor in control. Pruning does not appear to be an effective measure, though in small areas attacked by *Tarsonemus translucens* stripping off and destroying the younger growth might prevent its spread.

Owing to the hilly nature of the tea-growing districts in Ceylon spraying is impracticable and dusting with sulphur is the measure chiefly employed [*R.A.E.*, A, ii, 151]. It has also been suggested that for the destruction of *E. carinatus*, tea seedlings might be dipped in oil emulsions before being planted out. Measures that have been used against mites in other parts of the world are briefly reviewed.

DE MEL (C. N. E. J.). **Pests and Diseases of Coconuts in the North-Western Province.**—*Trop. Agriculturist*, lxxviii, no. 4, pp. 252–256. Peradeniya, April 1927.

The greater part of the entomological information contained in this paper is concerned with the coconut caterpillar [*Nephantis serinopa*, Meyr.] and has already been noticed from another source [*R.A.E.*, A, xv, 219]. The other important pests of coconut briefly dealt with are the black beetle [*Oryctes rhinoceros*, L.] and the red weevil [*Rhynchophorus ferrugineus*, F.].

**The Agricultural Pests Enactment, 1926.**—*F.M.S. Govt. Gaz.*, xix, no. 3, Suppmt., Notification no. 883, 10 pp. Kuala Lumpur, 11th February 1927.

Under this enactment to consolidate and amend the law relating to the protection of trees, plants and cultivated products in the Federated Malay States against diseases and pests, any inspecting officer has the right of entry on any land and of requiring the treatment of land and the destruction or treatment of plants or pests. In the event of the owner or occupier failing to carry out treatment as directed the work will be done at his expense. The Secretary for Agriculture may order any land to be placed in quarantine or to be cleared, and any plant to be immediately destroyed. Compensation may be paid, in certain

cases, for plants destroyed. The appearance of any dangerous pest or its eggs on any land must be immediately notified. The Chief Secretary to Government may make rules for preventing the introduction into, and the spread in, the Federated Malay States of any pest.

BATHELLIER (J.). **Sur les dommages causés par deux espèces de *Coptotermes* indochinois.**—*Rev. Bot. appl. & Agric. colon.*, vii, Bull. 67, pp. 170–172. Paris, March 1927.

Termites are numerous in Indo-China and cause considerable damage both to buildings and to crops. Among the most destructive are species of the genus *Coptotermes*, of which *C. travians*, Haviland, is a serious pest in houses. Its nests are made in the ground or in the interstices of brickwork, with no outside evidence of their existence. From these it constructs covered galleries by which it travels to the objects of its attacks. It can penetrate mortar and even a solid brick, and can found new colonies even in a small crevice. These should be located promptly and destroyed, for a nest once constructed is very difficult to trace or reach. *C. gestroi*, Haviland, is very destructive to crops in Indo-China, where it has been known to attack rubber trees in a plantation of young *Hevea*. It perforates the bark so that the tree exudes latex from the wounds, and then penetrates to the wood, which it destroys in concentric layers, which it constantly enlarges wherever the wood is tender. The author does not consider that termites could establish a nest on a healthy tree, but when nests are favourably situated the numbers of the insects increase to such an extent that they can attack and destroy objects in which they could not have established a colony.

FRANÇOIS (E.). **Sur deux ennemis de la pomme de terre à Madagascar.**—*Rev. Bot. appl. & Agric. colon.*, vii, Bull. 67, pp. 172–175. Paris, March 1927.

Potatoes are extensively cultivated in the higher districts of Madagascar. There are two pests of this crop, however, that are so injurious as to prohibit potato cultivation in the districts in which they occur. One of these is the Nematode, *Heterodera radicola*, Greeff, which hollows out a cavity in the epidermis of the tuber where the female oviposits, causing the surrounding tissues to blister. Galls are formed on the roots and young tubers; the plant stops growth and the stems die; such tubers as are gathered rot very quickly and cannot be stored. Infestation is always worst on ground that has been under cultivation for several years, particularly under maize. Maize, however, seems to suffer very little from this Nematode, although it must be numerous on the roots, as the ground on which this crop has been grown is always so heavily infested. Tubers required for seed can be disinfected by immersion for 30 minutes in a solution of 1 part commercial formol to 40 parts water.

The other pest is the Coccinellid, *Solanophila pavonia*, Oliv., which resembles in appearance, habits and mode of injury the Colorado potato beetle [*Leptinotarsa decemlineata*, Say]. The beetles appear in the central plateau of the Island about mid-January and breed rapidly on the plants, where all stages may be found simultaneously. Pupation takes place in the ground. Both adults and larvae devour the parenchyma and small veins of the leaves just before the flowering period,

thus preventing development of the tubers. The adults can fly fairly long distances, and the eggs are frequently transported on the tubers, so that disinfection of these is necessary. Damage can be limited by early planting. On infested plants hand collection of the adults is recommended. Poultry will readily eat both adults and larvae. In the province of Diego-Suarez, where *S. pavonia* is common on egg-plant [*Solanum melongena*], the larvae are preyed upon by another Coccinellid, *Cydonia lunata*, F. Unless strenuous efforts are made against these two pests, the industry of potato-growing will have to be abandoned in the Island.

GIRDWOOD (J.). **Worms in Furniture and Structural Timber.**—8vo, xvi+159 pp., 13 pls., 2 figs., 4 graphs, 4 refs. London, Oxford Univ. Press, 1927. Price 12s. 6d.

Experiments over a number of years have shown that turpentine, either alone, or in combination with not more than 10 per cent. kerosene, will effectually destroy furniture beetles (chiefly *Anobium punctatum*, DeG.) in all stages of development without injuring or discolouring the wood or polish. The limited use of turpentine in the past has been due to doubts regarding its powers of penetration and insecticidal value, and fear that the surface polish or patina would be softened for an indefinite period. The above mentioned experiments have proved these doubts and fears to be groundless. The failure of this method when it was employed appears to have been due to the insufficient amount of turpentine applied.

The method of treatment recommended for the preservation and restoration of infested furniture and for the preservation of modern or antique furniture not already attacked is given in detail and includes the destruction of the beetle by turpentine, the filling of the holes and the insertion of liquid fillers in very fragile pieces. Particulars are given of the equipment and materials required. The application of this method to the preservation of timber and decorative woodwork is discussed; it should prove equally effective provided the fluids can be applied in such a way that they will gain as ready access to the interior of the wood. In Britain such timber is chiefly attacked by *Xestobium rufovillosum*, DeG. Modifications of this method for use against timber-destroying insects in tropical countries are also given. The addition of kerosene, which is a powerful insecticide, to the turpentine has the advantage of increasing its power of penetration but causes slower evaporation. Kerosene cannot be used alone since it not only permanently darkens wood, but also softens a wax or oil polish or patina, and as it evaporates very slowly, the surface remains permanently softened.

**The Importation of Raw Cherries Order of 1927 (No. 2).**—2 pp. typescript. London, 16th June 1927.

To prevent the introduction of the cherry fruit-fly [*Rhagoletis cerasi*], no raw cherries grown in France may be imported into England or Wales, nor may any raw cherries not grown in France, but from any port in European France, be introduced, without a certificate as to country of origin. This order is in force from 24th June to 30th September 1927 and revokes a previous one [*R.A.E.*, A, xiv, 510].

BARNES (H. F.). **New Damage to Peas by the Pea Midge.**—*Jl. Minist. Agric.*, xxxiv, no. 2, pp. 159–161, 1 pl., 2 refs. London, May 1927.

There are two generations a year of *Contarinia pisi*, Winn. (pea midge) in England [*cf. R.A.E.*, A, xv, 62]. Mature larvae were found in the flowers in the third week in June, and a few adults were observed at the same time laying their eggs in the terminal shoots. Soon after the first week in July, the larvae leave the flowers and shoots and fall to the ground, where they pupate. The midges continue to emerge from the pupae from 14th July until the first week in August. They lay their eggs in any pods they can find; thus the second brood attacks the pods, while the first attacks the flowers, shoots or pods, whichever are available at the time of emergence of the adults. The early sown peas suffer most, those flowering after the first week in July being most free from attack. Infestation of the flowers and terminal shoots had not previously been observed, but in the case under consideration it was more serious than that in the pods.

The measures recommended are hand-picking the damaged flowers and shoots and soil fumigation with naphthalene, which should be dug in between the infested rows at the rate of 3 cwt. an acre.

**The Rhododendron Bug** (*Leptobyrsa (Stephanitis) rhododendri*, Horv.).—*Min. Agric. & Fish.*, Leaflet no. 165, 3 pp., 1 pl., 2 refs. London, February 1927. [Recd. May 1927.]

This is a revision of a paper on the bionomics and control of *Stephanitis rhododendri*, Horv., in Britain already noticed [*R.A.E.*, A, x, 554]; it is stated that the spray of 1 lb. soft soap to 10 gals. water should be applied about the third or fourth week in June, and again about a fortnight later, but no mention is made of the addition of nicotine.

**Wasps.**—*Min. Agric. & Fish.*, Misc. Pubns. no. 44, 8 pp., 2 pls., 4 refs. London, 1924. Price 4d. [Recd. May 1927.]

This paper gives a description of the seven species of wasps (*Vespa*) occurring in Great Britain, with an account of their bionomics as a whole. One of their true parasites is the beetle, *Metoecus (Rhipiphorus) paradoxus*, L., the larva of which is inadvertently carried by the wasp to its nest in the course of procuring materials for its construction.

It is not yet known to what extent harmful insects are destroyed by wasps, or whether the beneficial work done by them in this direction outweighs the damage done to fruit. Wasps are known to raid bee-hives, and some beneficial insects are also destroyed by them.

TURNBULL (J.). **Modern Fruit Tree Spraying and what it Costs.**—*Min. Agric. & Fish.*, Misc. Pubns. no. 58, 23 pp., 2 pls. London, 1927. Price 6d.

This paper demonstrates the improvement in the quality of fruit derived from spraying in orchards, and insists on the necessity of measures for warding off recurring epidemic attacks of pests. A table is given to show the output obtained by a man working  $8\frac{1}{2}$  hours with a number of different spraying appliances, varying from 80 gals. with a hand-worked appliance to 230 gals. with a 6 h.p. machine, the higher output being accompanied by better spraying. Another table shows the minimum amounts required to spray trees of various sizes. Suitable

outfits for various fruits are described. The initial cost and running expenses of the various types of outfits are discussed, and tables are given showing the total cost of applying one winter tar-distillate wash and two spring sprayings of lime-sulphur and lead arsenate for a small and a large acreage. Another table shows the annual charges with different kinds of outfits, indicating the amount of labour required in each case. There is very little difference in the cost of spraying an acre whether it is done on a small or a large scale, but great economy of labour may be effected with powerful machinery. Yet a further table shows the cost of two spring sprayings without a winter wash.

The rough cost of dealing effectively with general pests in a fully grown apple plantation is £10 an acre, or from 5*d.* to 7*s.* 6*d.* a tree. Plums are much less expensive to spray than apples, one winter tar-distillate wash being adequate, and the total cost amounting to £4 an acre, while bush fruits cost even less. A scheme for the season's spraying is drawn up for a number of fruits subject to different pests. Where it is necessary to apply two entirely different sprays at the same time, a light lime-sulphur and lead arsenate spray should be applied first, followed as soon as it is dry by nicotine and soap, which must be heavily sprayed to be effective. A combined application is less satisfactory, but will reduce less severe attacks, the substitution of casein for soap being recommended to avoid chemical action.

WARBURTON (C.). **Annual Report for 1926 of the Zoologist.**—*Jl. R. Agric. Soc. England*, lxxxvii, pp. 352–356. London, 1926. [Recd. May 1927.]

Although injurious insects were at least as abundant and varied as usual in 1926, comparatively little interest was taken in them as the weather was the principal cause of crop failure, particularly in the case of fruit. Wireworms and leather-jackets [*Tipula*] attacked cereals in the early stages, while at harvest-time thrips became abundant on oats and barley and the wheat midge [*Contarinia tritici*, Kby.] on wheat. *Tylenchus scandens*, Schn., which causes blackening of the grain of wheat, was unusually abundant in some localities. Mangels suffered from the pygmy beetle [*Atomaria linearis*, Steph.] and Collembola, while millepedes did considerable harm to beet. *Plutella maculipennis*, Curt., which was more abundant than for some years past in the extreme north and south of England on turnip, cauliflower and broccoli, is likely to be held in check in 1927 by the parasite, *Limneria gracilis*, Grav., which attacks the larvae. Weevils of the genus *Sitona* were somewhat destructive on beans, feeding by larvae on the roots being reported in addition to the usual damage by the adults to the leaves. The pea midge [*Contarinia pisi*, Winn.], generally considered to be of rare occurrence, was sufficiently common to attract notice. Cases of damage to cabbage by root-maggots [*Phorbia brassicae*, Bch.] and the cabbage flea-beetle [*Phyllotreta*] were reported. The carrot-fly [*Psila rosae*, F.] destroyed some early-sown carrots, the later-sown crops escaping, whereas they usually suffer most heavily from the pest. Parsnips sown for seed were attacked by *Depressaria heracleana*, DeG., the larva of which feeds in the parsnip heads, destroying the seeds. The apple crop suffered badly from many pests, including codling moth [*Cydia pomonella*, L.], apple blossom weevil [*Anthonomus pomorum*, L.], apple sucker [*Psylla mali*, Schmidb.] and many Aphids. Grease

bands and carbolineum winter washes have been of some use in controlling the Capsid bug [*Plesiocoris rugicollis*, Fall.], which has considerably extended its range of action. All fruit crops suffered from attack by Aphids, and the black cherry aphid [*Myzus cerasi*, F.] was particularly abundant. Although "big bud" in black-currants is now so widespread that the bushes, whether free from mites [*Eriophyes ribis*, Nal.] to begin with or cured by firing [*R.A.E.*, A, xii, 144], almost inevitably become reinfected within a few years, the growth of the old plants after burning is quite extraordinary. Where combustible material is available, firing would be cheaper than re-planting and at least equally effective. Specimens reared from the larvae of the plum sawfly that destroyed plums in the neighbourhood of Cambridge in 1925 were identified as *Hoplocampa flava*, L., so that the name *H. fulvicornis*, F., by which it has hitherto been known, may have been applied to it in error. This sawfly did not occur in any abundance in 1926.

Pests on ornamental plants included Aphids on chrysanthemums and the greater and lesser bulb-flies [*Merodon equestris*, F., and *Eumerus* spp.] on narcissus. The mites, *Glyciphagus domesticus*, DeG., and *Tyroglyphus (Aleurobius) farinae*, L., weevils, Ptinid beetles and larvae of the flour moth [*Ephestia kühniella*, Zell.] were among the pests recorded as feeding on foodstuffs.

HODSON (W. E. H.) & BEAUMONT (A.). **Third Annual Report of the Department of Plant Pathology for the Year ending September 30th, 1926.**—*Seale-Hayne Agric. Coll.*, Pamph. no. 21, 25 pp. Newton Abbot, Devon, 1927.

Cereal pests occurring in Devon and Cornwall during the season 1925-26 were *Oscinella (Oscinis) frit*, L., of which the late brood in the ear caused more damage than the earlier ones, probably owing to the fact that the mild climate in south-west England favours a more rapid growth of the young plants than is usual elsewhere; *Tipula* spp., which caused very heavy losses but are successfully controlled by a bait of bran and Paris green; *Agriotes* spp. (wireworms), which were more numerous than usual; and *Tylenchus dipsaci*, Kühn (stem eelworm), which caused less damage than in 1923-24. Forage crops were only damaged severely in one case, when they were attacked by *Apion* spp. (clover weevils). *Lygus pratensis*, L., and *Calocoris norvegicus*, Gmel., occurred on potato. *Pegomya hyoscyami*, Panz. (mangel fly), which was unusually abundant in the previous year, was remarkably scarce. *Euxoa segetum*, Schiff., was general on root crops after thinning, while *Phorbia (Chortophila) brassicae*, Bch., attacked vegetables and caused considerable damage to swedes. Pests of pulse crops included: *Sitona (Sitones)* spp., which were abnormally abundant and caused much injury; *Trialeurodes (Aleurodes) vaporariorum*, Westw., on runner beans; *Tetranychus* sp., causing severe damage to French beans under glass; and *Kakothrips pisivorus*, Westw. (*robustus*, Uzel) (pea thrips), which was more prevalent than usual. Vegetable pests included *Phyllotretas* pp. (flea beetles), *Barathra brassicae*, L. (cabbage moth), *Brevicoryne brassicae*, L. (cabbage aphid) and *Aleurodes brassicae*, Wlk. (cabbage whitefly). *Heterodera radicicola*, Greeff (root-knot eelworm) continued to injure tomatoes in spite of regular steam treatment of the soil. Pests of fruit included: *Otiorrhynchus singularis*, L. (*picipes*, F.) (clay-coloured weevil), which

caused considerable injury to young stocks; *Plesiocoris rugicollis*, Fall., on apple and black currant; *Psylla mali*, Schmidb. (apple sucker), which was more plentiful than usual; Aphids, particularly *Capilophorus ribis*, L., on currant, *Myzus cerasi*, F., on cherry and *Eriosoma lanigerum*, Hausm., on apple; *Caliroa* (*Eriocampa*) *limacina*, Retz. (pear sawfly), which caused considerable injury, particularly to young trees; *Pteronus* (*Nematus*) *ribesii*, Scop. (gooseberry sawfly); winter moths, including *Cheimatobia brumata*, L.; *Cydia pomonella*, L. (codling moth); *Tortrix* spp.; *Tetranychus* sp. (the extensive injury to strawberry and plum caused by this mite being probably due to the unusually warm dry period in the autumn); and *Eriophyes pyri*, Pagst., which damaged both foliage and fruit of pears.

Plots of pyrethrum withstood the winter in the open and yielded an average crop of flowers the following summer. Tests of its insecticidal value showed that it is probably equal to the average French commercial crop.

Experiments carried out to estimate the effect of the attack of *Ceuthorrhyncus pleurostigma*, Marsh. (cabbage gall weevil) on broccoli plants indicated that it is not very harmful unless the galls are particularly numerous, but severe attacks of this weevil in broccoli fields have since been reported, and in one or two instances the almost complete failure of the crop has resulted, apparently entirely owing to this pest.

Since previous introductions of *Aphelinus mali*, Hald., for the control *Eriosoma lanigerum*, Hausm., were not entirely successful [*R.A.E.*, A, xiii, 321; xiv, 215], another attempt was made. The parasites were bred on infested trees under glass and adults of successive generations were liberated and appear to have become established in three localities.

The information concerning the habits of *Gracilaria azaleella*, Brants. (azalea leaf miner) has already been noticed [*R.A.E.*, A, xv, 118].

Damage to narcissus by *Merodon equestris*, F. (large bulb fly) and *Eumerus strigatus*, Fall., and *E. tuberculatus*, Rond. (lesser bulb flies) is particularly severe in the west of England. The life-histories of the two species of *Eumerus* were found to be similar. There may be one or two generations in a year, and sometimes a partial third, the number depending largely on local conditions. The eggs were first found on 24th May and were seen as late as 23rd August, but were very scarce after the end of July, oviposition being at its height in June. They are laid either below ground on the bulbs, or on the dried foliage and ground surrounding the hollow made round the bulb by the shrivelling of the leaves. They may be deposited on or near healthy bulbs, which the larvae can enter and destroy, as well as diseased ones, a slight preference being shown for the latter. The larvae are apparently unable to migrate from one bulb to another, and partly grown ones had difficulty in entering a bulb once they had been removed. The winter is invariably passed as a larva, and pupation usually occurs in April. The following measures are recommended. At the time of planting all soft bulbs should be discarded and destroyed to prevent flies emerging later and attacking healthy plants. When lifted, all bulbs should be subjected to the hot water treatment used against *Tylenchus dipsaci*, Kühn (bulb eelworm) [*R.A.E.*, A, xiv, 287, etc.], which is equally effective against bulb-fly larvae. As an alternative, they should be fumigated in air-tight containers for five days with

crystals of paradichlorobenzene at the rate of 4 oz. to a cubic foot. This method will kill bulb-fly larvae and the bulb mite, *Rhizoglyphus echinopus*, F. & R. (*spinitarsus*, Can.), but has not been tested as a control for eelworms. Lifted bulbs should not be left to dry off on the surface of the soil, where they are exposed to attack, but should be dried in an outbuilding, since flies will not enter such cover for the purpose of egg-laying. Small heaps of worthless bulbs may be left near the beds of growing bulbs to attract the ovipositing females; these should be subsequently removed and destroyed. The beds should be raked over towards the end of May, wherever the foliage has died down sufficiently, so that the flies may not be able to locate the cavities around the bulbs. Partly dead foliage may be cut off short and the ends earthed over. Those varieties that carry their foliage longer appear to be less liable to attack.

A list of those insects not reported in the two preceding years [*R.A.E.*, A. xiii, 320; xiv, 215] and those occurring on food-plants previously unrecorded is appended.

**Collected Leaflets on Insect Pests of Farm and Garden Crops.**—*Minist. Agric. & Fisheries*, Sectional vol. xi, 111 pp., pls., figs., refs. London, 1926. Price 1s. 3d. [Reed. May 1927.]

This collection contains 27 leaflets on insect pests of farm and garden crops, with a general introduction on insect pests and methods of controlling them by Mr. J. C. F. Fryer.

**TATTERSFIELD (F.) & GIMMINGHAM (C. T.). Studies on Contact Insecticides. Part V. The Toxicity of the Amines and *N*-heterocyclic Compounds to *Aphis rumicis* L.**—*Ann. App. Biol.*, xiv, no. 2, pp. 217–239, 6 diags., 23 refs. Cambridge, May 1927.

Previous papers of this series and a paper on the technique employed in carrying out the experiments have already been noticed [*R.A.E.*, A, xii, 225; xiii, 158, 362; xiv, 512]. This paper is concerned with the toxicity of certain aliphatic and aromatic amines and of some of the simpler nitrogen heterocyclic derivatives to *Aphis rumicis*, L. (bean aphid). Among the aliphatic amines studied, particular attention was given to tetramethyl and tetraethyl compounds. The tetramethylammonium chloride and hydrate proved to be more toxic than the corresponding tetraethylammonium compounds; for instance 100 per cent. of the Aphids were killed by tetramethylammonium chloride at a concentration of 0.75 gms. per 100 cc., and by tetramethylammonium hydroxide at a concentration of 2, whereas the chloride and hydroxide of tetraethylammonium at the latter strength killed only 75 and 63.5 per cent. respectively. This accords with the findings of other workers who have shown that tetramethylammonium has certain physiological effects similar to those of nicotine that are not shown by tetraethylammonium. Trimethylamine hydrochloride was only slightly less toxic than tetramethylammonium chloride. Other quaternary compounds such as phenyl-trimethylammonium hydroxide and  $\alpha$ -naphthyl-trimethylammonium hydroxide were used in experiments of a preliminary nature, but showed that the methyl group cannot be replaced by the aromatic radicals phenyl or  $\alpha$ -naphthyl with any advantage, the resulting compounds being on the whole less toxic than tetramethylammonium hydroxide. Dimethylbenzylphenylammonium hydroxide

shows a toxicity similar to that of tetramethylammonium hydroxide when molecular comparisons are made, but is much less toxic when compared on a gram for gram basis. Thus the tetramethylammonium radical would appear to be unique in its toxic action.

The aromatic amines on the whole show little insecticidal action. Aniline (phenylamine) and most of the aliphatic anilines such as methylaniline are only slightly toxic to *A. rumicis*, a concentration of 10 per cent. in the case of aniline and between 2 and 5 per cent. for the aliphatic derivatives being necessary to give 100 per cent. mortality. The substitution of aromatic groups in the amino group of aniline increases the toxicity more than the substitution of aliphatic groups. Thus 100 per cent. of the Aphids were killed by diphenylamine at a concentration of 1 gm. per 100 cc. and by dibenzylamine at a concentration of 0.5 per cent. ; while benzyaniline killed 97.5 per cent. of the Aphids at a concentration of 1 per cent. In these compounds, if ammonia ( $\text{NH}_3$ ) is taken as the basic radical, two of the hydrogen atoms have been replaced by aromatic nuclei, and since these compounds are decidedly more toxic than those in which only one of the hydrogen atoms is replaced, such as phenylamine (aniline) and benzylamine, or those in which all three hydrogen atoms are replaced, such as triphenylamine, tribenzylamine or dibenzylaniline, the question is raised as to whether the last hydrogen atom attached to the nitrogen and remaining unsubstituted has not a definite significance in determining the toxicity. This hydrogen atom can, however, be replaced by the methyl radical without loss of toxic properties since methyl-diphenylamine gave 100 per cent. mortality at a concentration of 0.35 per cent. and methyl-benzyaniline at a concentration of 1 per cent. The phenyl group appears to be of greater significance than the benzyl group when used for substitution. The substitution of a second amino group in the *o*, *m* or *p* position, or of chlorine or hydroxyl groups in the aniline ring produces no marked increase in toxicity. The introduction of a nitro group in the *o* position to the amino group in aniline has a pronounced effect of toxicity, *o*-nitraniline being one of the most toxic derivatives of aniline tested (100 per cent. mortality being obtained with a concentration of 0.5 per cent.).

All the  $\beta$ -naphthylamine derivatives tested were less toxic than the corresponding  $\alpha$ -compounds.  $\alpha$ -Naphthylamine is more toxic than aniline (100 per cent. mortality being obtained with a concentration of 1 per cent.). In general, however, the substitution of various radicals in the amino group of aniline has a greater effect on the toxicity of the resulting compound than substitution of the same radicals in  $\alpha$ -naphthylamine. As in the case of the corresponding aniline derivatives, phenyl- $\alpha$ -naphthylamine and nitro- $\alpha$ -naphthylamine were more toxic than the other  $\alpha$ -naphthylamine derivatives tested. Thus the introduction of the naphthyl group into the ammonia radical ( $\text{NH}_3$ ) affects the toxicity more than the introduction of a phenyl group ; but the substitution of a phenyl nucleus in the amino group of aniline increases toxicity proportionally to a greater extent than its substitution in the amino group of  $\alpha$ -naphthylamine.

As regards the relationships between toxicity and structure from the standpoint of substitution in the respective hydrocarbon nuclei, it is found that the introduction of the amine group into benzene or into naphthalene materially increases toxicity ; but the influence of the amine group does not appear to be additive since the introduction of a second  $\text{NH}_2$  does not give rise to any great increase in toxicity (the

$\alpha$ - $\beta$ -diamine of naphthylene is less toxic than  $\alpha$ -naphthylamine). The  $\text{NH}_2$  group in the aromatic amines may act by increasing the affinity for oxygen, and there may be an optimum degree of activity and, if a compound absorbs oxygen too rapidly, its toxic action may be destroyed before reaching a vital point of the insect. Thus the diamines, which are less stable than the monamines, may show less toxic action because they are oxidised to innocuous derivatives shortly after spraying.

Among the nitrogen-heterocyclic compounds, nicotine ( $\beta$ -pyridyl- $\alpha$ -N-methylpyrrolidine) is highly toxic to *A. rumicis*, and results of experiments carried out over a period of three years indicate that on an average a concentration of 0.1 gm. per 100 cc. killed 90–100 per cent. of the adult insects. In small scale field trials on beans heavily infested with all stages of *A. rumicis*, it was found that, using soft soap as a spreader, a concentration of 0.025 per cent. gave good control, 0.05 per cent. good to complete control and 0.1 per cent. complete control.

The heterocyclic rings constituting the molecule of nicotine are individually much less toxic than nicotine and show comparatively little insecticidal action. Pyrrole showed an anaesthetic action, but was not materially toxic at a concentration of 10 per cent., while pyridine gave 100 per cent. mortality at the same concentration. The hydrogenation of these substances to pyrrolidine and piperidine considerably increased their toxic action, pyrrolidine giving 100 per cent. mortality at a 1 per cent. concentration, and piperidine at a concentration of 2.5 per cent. This may be due to increased activity and a consequent increased effect upon the nervous system. Both are, however, much less toxic to insects than nicotine, which undoubtedly owes its high potency to its molecular structure as a whole; the attachment of the pyrrolidine nucleus in the  $\beta$ -position of the pyridine ring, and the presence of an asymmetric carbon atom may be significant. The results obtained from testing other members of this group, ranging from picoline (giving 100 per cent. mortality at 7.5) to acridine (giving 100 per cent. mortality at 0.75), showed that there is a steady increase in toxicity as the molecular weight increases. The introduction of aliphatic side chains into compounds of this group increases the toxicity, the effect increasing in passing up the above-mentioned series from pyridine to acridine. Whether this is due to an increase in molecular weight or to change in some physical property in correlation to the increased bulk of the molecule has not, up to the present, been ascertained. The substitution of a benzyl group in pyridine increases the toxicity of pyridine to a considerable extent and benzylpyridine was found to be the most toxic of the pyridine derivatives tested with the exception of nicotine, concentrations of about 0.2 per cent. killing 100 per cent. of the insects.

A few substances found toxic in the laboratory were tried on a larger scale on plots of broad beans heavily infested with *A. rumicis*, 0.35 per cent. soft soap solution being added to ensure wetting and spreading. Tetramethylammonium chloride and sulphate gave complete control at a concentration of 0.35 per cent. of the base, with no injury to the plants, the sulphate also giving good results at a concentration of 0.125 per cent. of the base.  $\alpha$ -Naphthylamine and mono-methyl- $\alpha$ -naphthylamine destroyed the Aphids when used at concentrations of 0.4 per cent., but caused considerable damage and staining to the foliage; dimethyl- $\alpha$ -naphthylamine did not injure the foliage but was slightly less effective as an insecticide. The only pyridine derivative tested was benzylpyridine, which killed all the insects at a concentration of 0.1 per cent. without damage to the plants. If this oil could be prepared cheaply, it might find some use as a contact insecticide.

MILES (H. W.). **On the Control of Glasshouse Insects with Calcium Cyanide.**—*Ann. App. Biol.*, xiv, no. 2, pp. 240-246, 7 refs. Cambridge, May 1927.

Much of this information concerning the results of experimental fumigation of greenhouses with calcium cyanide since its introduction into Great Britain in 1925, has already been noticed [*R.A.E.*, A, xiv, 509]. The dosages used against *Trialeurodes* (*Aleurodes*) *vaporariorum*, Westw., on such plants as chrysanthemum, azalea, runner bean, cucumber, freesia, tomato and arum, ranged from  $\frac{1}{12}$  to  $\frac{3}{4}$  oz. to 1,000 cu. ft. In spring, when plants are usually soft and tender, they can only be fumigated with a low dosage, but under suitable conditions  $\frac{1}{2}$  oz. kept down the numbers of the whitefly satisfactorily. A dosage of  $\frac{1}{4}$  oz. was employed for older plants of tomato, etc.;  $\frac{1}{8}$  oz. for chrysanthemums and the higher dosages of  $\frac{1}{2}$ – $\frac{3}{4}$  oz. for mature tomatoes towards the end of the season under abnormally dry conditions; these dosages giving effective control. In most cases the temperature ranged from 55° F. to 70° F. and the humidity varied from 70–95 per cent. Under very dry conditions it was necessary to damp the path an hour or two before fumigation; in other cases the paths were so damp that satisfactory fumigation was not obtained until the calcium cyanide was sprinkled on dry boards. Local conditions influenced results to a considerable extent, leaky glasshouses, excess of moisture on the paths, low temperatures and high winds often being responsible for unsatisfactory results.

In discussing experiments on the control of Aphids the author states that *Macrosiphum* (*Macrosiphoniella*) *sanborni*, Gill., under ordinary conditions is easily controlled at a dosage of  $\frac{1}{4}$  oz. [*cf. loc. cit.*].

Fumigations with calcium cyanide were found to kill adult thrips (which included *Parthenothrips dracaenae*, Heeg., on palms), but failed to destroy the immature forms. Dosages of  $\frac{1}{3}$ – $1\frac{1}{2}$  oz. to 1,000 cu. ft. killed varying percentages of the adults, and a series of fumigations was found to give satisfactory control. Two instances are cited where continued fumigations with calcium cyanide apparently resulted in the control of mealybugs in Guernsey; *Pseudococcus maritimus*, Ehrh., on tomatoes was fumigated at weekly intervals with a dosage of  $\frac{1}{5}$  oz., and a mealybug on vines at the same intervals with a dosage of  $\frac{1}{4}$  oz., this being increased to  $\frac{1}{3}$  oz. after several weeks.

The cost of this method compares very favourably with that of the older one of fumigation with sodium cyanide and sulphuric acid, the fumigation of a glasshouse of 40,000 cu. ft. with a  $\frac{1}{4}$  oz. dosage working out at 1s. 8d. excluding the cost of labour, which is small, since the operator has merely to pour the calcium cyanide from the tin into a graduated funnel and read off the required amount.

MILES (H. W.). **Calcium Cyanide as a Glasshouse Fumigant.**—*Scottish Jl. Agric.*, x, no. 1, reprint 5 pp. Edinburgh, 1927.

The greater part of the information contained in this paper on the fumigation of glasshouses in Great Britain with calcium cyanide is also given in the preceding one. In commercial glasshouses of the open range type it frequently happens that insect attack is localised, or that crops growing side by side are not equally resistant to the action of hydrocyanic acid gas. In these cases it has been found that canvas curtains or wooden supports to which oiled or tarred paper has been fastened can be used to enclose the portion to be fumigated, provided

that they reach from roof to floor and thus prevent so far as possible the dispersion of the fumes.

Sunlight predisposes plants to injury by hydrocyanic acid gas, and it is therefore inadvisable to carry out fumigations until about an hour after sunset, and in summer when the nights are short and the sunlight becomes intense in the early morning, the glasshouses should be opened soon after dawn.

There should be no moisture on the leaves of plants at the time of fumigating, as hydrocyanic gas has a strong affinity for moisture and forms a weak solution of prussic acid on the foliage. The absorption of this acid by the leaf or its contact with the epidermis may cause scorching. Moisture on the leaves may occur in two ways. After a sunny day in a heated house it may be found that, owing to the warmth of the soil, the plants are taking up more moisture than the leaves can transpire into the cooler evening air, with the result that globules of moisture are exuded through the pores. On the other hand moisture may be deposited directly on the plants in the form of dew as a result of a fall of temperature in a glasshouse having a high degree of humidity. Since humidity is so closely related to temperature, the latter should be maintained as nearly constant as possible during fumigations. These have been most successfully carried out between temperatures of 55° F. and 70° F.

Emphasis is laid on the fact that it is preferable to obtain control of a pest with a series of about three fumigations at intervals of about ten days with a low dosage than to risk injury to the plants by attempting to eradicate the pest with one severe fumigation. Growers should commence a series of fumigations with a low dosage, gradually increasing the amount of calcium cyanide until a satisfactory control is obtained without any injurious effects on the plants.

MILES (H. W.). **Calcium Cyanide for Glasshouse Fumigation in Great Britain.**—*Covent Gardener*, no. 10, supplmt., 3 pp. London, May 1927.

A list is given of the glasshouse plants successfully fumigated with calcium cyanide in Great Britain, with particulars of temperature and humidity wherever possible. In most cases the dosage given is that which proved quite harmless to the plants, for although many plants can be fumigated with much higher dosages without injury, the lowest dose at which the insect pest can be controlled is the most satisfactory to use, even though several fumigations may be necessary. With the higher dosages there is greater risk of injury with less fall in temperature than with lower dosages. A list is also given of the insect pests controlled with this fumigant, the dosages employed and the conditions of temperature and humidity obtaining.

[VASIL'EV (I. V.). Васильев (И. В.). **Autumn Observations on Phylloxera.** [In Russian.]—*Vestnik Vinod. Ukrain.*, xxviii, no. 3, pp. 167–171. Odessa, March 1927.

This is the first paper resulting from the inauguration of a study on *Phylloxera* in the Ukraine. An account is given of the leaf-galls and root infestation of the different varieties of vines; though attacks are

common, the plants survive owing to the use of resistant stocks. Various predacious insects and spiders have been observed attacking the eggs and the larvae; these include *Phaneroptera falcata*, Scop., which occasionally eats the galls on the leaves [cf. R.A.E., A, xiii, 213].

[PRINTZ (Ya. I.).] **Принц (Я.).** *Phylloxera* in Azerbaijan. [In Russian.]—*Vestnik Vinod. Ukrain.*, xxviii, no. 3, pp. 171–175. Odessa, March 1927.

Observations in Azerbaijan during 1926 suggest that *Phylloxera* was introduced in 1914–15. The infestation is very scattered, amounting in all to about 35 acres, 9 per cent. of which is the result of spread since 1925. Owing to this scattered nature of the centres of infestation the radical method of uprooting all infested stock and fumigating the soil with carbon bisulphide is not recommended by the author. Even with a most careful inspection it is possible that one or two isolated infested bushes might be overlooked and thus prove a source of re-infestation. Contrary to Mordvilko's view [R.A.E., A, xiv, 195], the author considers that, at any rate in limited areas, the main form of dispersal is on clothing, boots and implements. Apart from the reasons already stated, the complete eradication of *Phylloxera* by fumigation and destruction of plants would not be successful in Azerbaijan owing to the proximity of infested areas in Armenia and Georgia. Under present conditions it would not be economically possible to re-establish local vineyards on resistant stock, but every effort should be made to raise sufficient resistant stock for future distribution. A normal crop may be produced for several years in infested areas by soil fumigation, by which 90 per cent. of the Aphids may be destroyed annually. It is further recommended that the radical measures should be applied in certain localised areas, adjacent vineyards being treated with carbon bisulphide and gradually transferred on to resistant stock, by which means it is estimated that *Phylloxera* might be under control by 1930 without any heavy expenditure or risk. The winged forms do not play any part in the distribution of the pest in Azerbaijan, the areas under vines being about 13–20 miles apart.

Regulations that have been suggested for the control of *Phylloxera* are appended.

[GERNET (V.).] **Гернет (В.).** The Problem of the Control of *Phylloxera* in Azerbaijan. [In Russian.]—*Vestnik Vinod. Ukrain.*, xxviii, no. 3, pp. 176–177, 1 ref. Odessa, March 1927.

In commenting on the regulations appended to the preceding paper, the author points out that while the transportation of material from infested areas in Azerbaijan is to be restricted, no provision is made for protection against foreign areas of infestation. Further the actual cost of the measures to be enforced will fall on the growers. Grafting on resistant stock is the only satisfactory method and should be carried out as soon as possible.

GEISSLER (A.). Das „Bioklimatische Gesetz“ von Hopkins und der Versuch seiner Nutzbarmachung für die Landwirtschaft. [The Hopkins Bioclimatic Law and the Attempt to utilise it for Agriculture.]—*Nachrichtenbl. deutschen Pflanzenschutzdienst*, vii, nos. 4 & 5, pp. 35–36 & 43–44. Berlin, April–May 1927.

The author briefly discusses Hopkins' bioclimatic law and its application to agriculture, including insect pests [*R.A.E.*, A, viii, 87], and concludes that while apparently suited to wheat in the conditions of the wheat belt of North America, it is less applicable to other crops in other regions, especially in Europe, where, for instance, the summer and winter isotherms do not correspond as they do in the North American wheat belt.

**Krankheiten und Beschädigungen der Kulturpflanzen im Januar bis März 1927.**—*Nachrichtenbl. deutschen Pflanzenschutzdienst*, vii, no. 5, pp. 46–51. Berlin, May 1927.

This report contains annotated lists of the insect pests recorded in Germany during the period under review, divided according to the class of crop attacked.

SCHAFFENIT (—). Die Mosaikkrankheit (Gelbfleckigkeit) des Spinats und ihre Uebertragung durch Insekten. [Mosaic or Yellow Spot of Spinach and its Transmission by Insects.]—*Zeitschr. Pflanzenkrankh.*, xxxvii, no. 5–6, pp. 173–174, 2 refs. Stuttgart, 1927.

A mosaic disease of spinach common on the Rhine between Bonn and Cologne was finally traced to a virus carried by *Aphis rumicis* (*fabae*) and another Aphid, probably *Illinoia* (*Macrosiphum*) *pisi*. An abstract by E. Brandenburg of another paper on this subject [*R.A.E.*, A, vi, 453] is annexed to these notes.

BODENHEIMER (F. S.). Ueber die ökologischen Grenzen der Verbreitung von *Calandra oryzae*, L., und *Calandra granaria*, L. (Col. Curcul.). [The ecological Limits of Distribution of *C. oryzae* and *C. granaria*.]—*Zeitschr. wiss. Insektenbiol.*, xxii, no. 3–4, pp. 65–73, 3 figs., 5 refs. Berlin, 10th May 1927.

The data published by Back and Cotton on the effect of temperature on the rice weevil, *Calandra oryzae*, L., and the grain weevil, *C. granaria*, L. [*R.A.E.*, A, xiii, 46, etc.] enable the ecology of these species and their geographical limits to be determined, the method of calculation being that described in a previous paper [A, xiv, 415]. The results obtained can be summed up as follows: Low temperature limit of occurrence, monthly average of 3° C. [37·4° F.] for *C. oryzae* and –5° C. [23° F.] for *C. granaria*. High temperature limit, monthly average of probably 30° C. [86° F.] for *C. oryzae* and 25° C. [77° F.] for *C. granaria*. Zero point of development, 13·1° C. [55·58° F.] for *C. oryzae*, and 9·5° C. [49·1° F.] for *C. granaria*. Thermal constants, or sum of warmth necessary for the development of a generation [cf. *R.A.E.*, A, xiii, 389]: 358·8 Centigrade degrees [645·84 Fahrenheit degrees] for *C. oryzae*, and 523 [941·4] for *C. granaria*. Critical heat point equal to the shortest development duration: about 28° C. [82·4° F.] for both species. Beginning of oviposition at about 13–15° C.

[55·4–59° F.] for both. End of oviposition at 34° C. [93·2° F.] for both. Optimum vitality of the adults, *i.e.*, least mortality : 12–16° C. [53·6–60·8° F.] for *C. oryzae* and 15–20° C. [59–68° F.] for *C. granaria*. Vital limit of immature stages : about 35° C. [95° F.] for *C. oryzae* and about 30° C. [86° F.] for *C. granaria*.

ZACHER (F.). **Versuche zur Bekämpfung des Kornkäfers mit pulverförmigen Mitteln.** [Experiments with chemical Dusts against the Grain Weevil.]—*Mitt. Ges. Vorratsschutz*, iii, no. 3, pp. 30–34, 3 refs. Berlin, May 1927.

The good results obtained with copper carbonate dust against *Calandra granaria*, L. [*R.A.E.*, A, xiii, 499 ; xv, 8] have led to experiments with a number of chemical dusts. Of a series of proprietary seed disinfectants, two proved as effective as copper carbonate. Another series of dusts included Paris green, borax, pardichlorobenzene, pyrethrum, and dusts containing sulphur. Of these, only paradichlorobenzene and pyrethrum proved satisfactory.

REH (L.). **Eigenartige Schädigungen durch Speckkäfer** (*Dermestes vulpinus* F.). [Peculiar Injury by the Bacon Beetle, *D. vulpinus*.]—*Mitt. Ges. Vorratsschutz*, iii, no. 3, pp. 34–35. Berlin, May 1927.

A shipment of woollen goods from Hamburg to Buenos Aires was found to be infested and injured by *Dermestes vulpinus*, F., after arrival in Argentina. Investigation showed that on the preceding voyage the vessel had carried a cargo of hides to Hamburg and had not been thoroughly cleaned before reloading so that beetles from the hides remained to attack the woollen goods. There exist records of tobacco being infested by this beetle, and the author recently saw a shipment of Havana cigars harbouring adults, pupae and larvae. But his observations showed that *D. vulpinus* leaves its food-material in order to pupate in soft, solid material such as cork, and tobacco is only infested for this purpose and not for feeding. In this case the ship was carrying hides at the same time as cigars.

TEMPEL (W.). **Auftreten des Birnknospenstechers** (*Anthonomus cinctus*, Redt.) in Sachsen. [Occurrence of the Pear Blossom Weevil, *A. cinctus*, in Saxony.]—*Die kranke Pflanze*, iv, no. 4, pp. 55–56. Dresden, April 1927.

In 1925 *Anthonomus cinctus*, Redt., did considerable injury to pears in Saxony. The larvae feed from the middle of February to early May in the buds, with the result that the shoots are stunted and fail to fruit. *A. cinctus* is a more serious pest than *A. pomorum*, L., is in apples because the larva destroys an entire cluster of blossoms instead of a single one. Pupation lasts 8–10 days and takes place in the bud. The infested buds should be picked and burnt.

LANDGRAF (T.). **Der Kampf gegen die Apfeltriebmotte.** [Work against the Apple Shoot Moth.]—*Die kranke Pflanze*, iv, no. 5, pp. 81–82, 1 fig. Dresden, May 1927.

The apple shoot moth, *Blastodacna putripennella*, Zell., did considerable damage in various localities in Germany in 1926. The adults occur in July and August and oviposit on apple leaves, on which the newly

hatched larvae feed. In autumn they bore into the buds of the one-year shoots and winter in them. In spring they bore into the base of the one-year shoots and devour the pith, and by May or June these shoots are defoliated or dead, the blossom-buds having been destroyed. Spraying in winter with a 10 per cent. solution of fruit-tree carbolineum has been advocated. Special attention to this infestation should be paid when pruning in winter. In May and June the full extent of the infestation becomes apparent, and a further pruning is needed. The débris must be burned.

TEMPEL (W.). **Blattläuse am Pfirsich.** [Aphids on Peach.]—*Die kranke Pflanze*, iv, no. 5, pp. 82–84, 1 fig. Dresden, May 1927.

Considerable injury is done to peaches in Saxony by Aphids, chiefly by *Aphis amygdali*, Buckt. (*persicae*, Boy.) and *Anuraphis helichrysi*, Kalt. (*Aphis pruni*, auct.). The former gives rise to a pronounced leaf-curl, while the latter curls the leaf-edges only. *A. amygdali* may be combated by crushing the colonies where the attack is slight. In a severe infestation the entire tips of the shoots should be cut off and burnt, or a dust insecticide may be used. *Anuraphis helichrysi* can be treated with quassia or nicotine sprays or with a dust insecticide, applied before the buds open and again before the leaves open.

EIDMANN (H.). **Weitere Beobachtungen über den Nutzen der roten Waldameise.** [Further Observations on the Utility of the Red Forest Ant.]—*Anz. Schädlingsk.*, iii, no. 5, pp. 49–51, 2 figs. Berlin, 15th May 1927.

Further particulars are given as to the value of the red forest ant [*Formica rufa*, L.] in destroying injurious forest insects in Germany [*R.A.E.*, A, xv, 52]. A number of instances are quoted of entire stands being preserved by this ant from defoliation by caterpillars.

REH (L.). **Frostspanner-Fragen.** [Winter Moth Questions.]—*Anz. Schädlingsk.*, iii, no. 5, pp. 52–53, 2 refs. Berlin, 15th May 1927.

In the autumn of 1925 large numbers of both sexes of the winter moth [*Cheimatobia brumata*] were observed near Hamburg. In that of 1926 the moths failed to appear until mid-November (4–6 weeks late), and females were almost completely absent, the usual predominance of the males being extraordinarily intensified. The cause of this is uncertain.

JÄCKH (E.). **Zur Entwicklung von *Gracilaria azaleella*, Brants.** [On the Development of *G. azaleella*.]—*Anz. Schädlingsk.*, iii, no. 5, pp. 53–54. Berlin, 15th May 1927.

During the winter of 1926–1927 the azalea leaf-miner, *Gracilaria azaleella*, Brants, occurred in increased abundance in nearly all commercial greenhouses in Bremen.

The observations on the life-history of this Tineid confirm those already noticed [*R.A.E.*, A, xv, 118]. For pupation the larvae spun their cocoons on the lower surface of the leaves. Pupal stages lasting from 4th February to 2nd March and from 10th December to 13th March were observed. Emergence seems favoured by moisture; many moths appeared suddenly after the azalea leaves had been wetted.

L. ENDRICH (K.) & MAYER (F.). **Ueber das Vorkommen von Arsen und Blei auf Obst als Folge der Schädlingbekämpfung.** [On the Occurrence of Arsenic and Lead on Fruit as a Result of Spraying.] —*Zeitschr. Unters. Lebensm.*, lii, pp. 441–457. 1926. (Abstract in *Anz. Schädlingssk.*, iii, no. 5, pp. 57–58. Berlin, 15th May 1927.)

Examinations of fruit from the United States made at Hamburg for the presence of arsenic and lead showed that in most if not all the cases it did not occur in amounts sufficient to be harmful.

**Ein neues Flugzeug für die Forstschädlingbekämpfung.** [A new Aeroplane for Work against Forest Pests.]—*Anz. Schädlingssk.*, iii, no. 5, pp. 58–59. Berlin, 15th May 1927.

The production of special aeroplanes that take off in a limited space, land at a slow speed, turn readily, are very stable and have a large storage capacity for a dust insecticide, is announced.

FAES (H.) & STAEHELIN (M.). **Les champignons et les insectes ennemis du cerisier.**—*Ann. agric. Suisse*, xxviii, no. 1, pp. 1–27, 14 figs., 13 refs. Bern, 1927.

Part of this paper deals with the control of *Cheimatobia brumata*, L., by means of sticky bands [*R.A.E.*, A, xii, 455 ; xiv, 118, 348]. In one district, where this moth was found attacking pear, plum, quince, walnut and cherry, the latter being the most severely attacked, the application of such bands was made compulsory. Tables are given showing the numbers of moths of each sex captured on various trees by this method during the years 1924–1926.

TONDUZ (P.). **Action de quelques produits insecticides ou fungicides sur les métaux et alliages pouvant être utilisés dans la construction des pulvérisateurs.**—*Ann. agric. Suisse*, xxviii, no. 1, pp. 28–39. Bern, 1927.

This paper describes a series of experiments carried out to determine the action of various chemicals employed as insecticides or fungicides on metals and alloys likely to be used for the construction of spraying machines, tinned copper, brass and a proprietary alloy proving the most resistant of the materials tested. Untreated copper is rapidly attacked by lime-sulphur or alkaline polysulphide mixtures, though spraying machines made of this metal can be temporarily protected against their action by covering the interior with a copal or other resinous varnish. Lead is quickly attacked and dissolved by copper acetate, and sprays based on this chemical must never be used in apparatus made of leaded copper or leaded sheet iron. Lead, however, protects copper against alkaline polysulphides, a slight coating of sulphide forming over the metal and preserving it. Iron, which oxidises too easily, is not a suitable material for spraying machines, nor are galvanised iron or zinc, which are too susceptible to the chemical action of both acids and alkalies to be recommended. Aluminium is also sensitive to the action of alkaline and saline solutions, particularly the commercial metal, which contains impurities such as iron or manganese. Iron, zinc and aluminium, like copper, can all be temporarily protected by means of a resinous varnish.

FAES (H.). **Puceron lanigère.**—*Terre vaudoise*, xix, no. 18, pp. 284-285, 3 figs., 1 ref. Lausanne, 30th April 1927.

In this article, which is a reprint from the author's book, "Les maladies des plantes cultivées et leur traitement," a popular account is given of the bionomics and control of *Eriosoma (Schizoneura) lanigerum*, Hausm., the most serious pest of apple trees in Switzerland.

LEUZINGER (H.). **Die Fangglasmethode in der Bekämpfung des Heu- und Sauerwurms im Kanton Wallis.** [The Trap-glass Method in Work in the Canton of Valais against the Spring and Summer Generations of the Vine-moths.]—*Schweiz. Zeitschr. Obst- u. Weinbau*, xxxvi, no. 10, pp. 166-169. Wädenswil, 14th May 1927.

A general trial in 1925 of traps consisting of glass jam jars baited with a solution of sugar, honey or molasses, as indicators of the flight-periods of the vine-moths [*Clysia ambiguella*, Hb., and *Polychrosis botrana*, Schiff.] in Valais proved the great value of this method.

MALENOTTI (E.). **Una speciale questione diaspidica.** [A special Question regarding the Mulberry Scale.]—*Il Coltivatore*, 1927, no. 13, reprint 8 pp. Casale Monferrato, 1927.

Since its introduction into Italy about twenty years ago for the purpose of controlling *Aulacaspis (Diaspis) pentagona* infesting mulberry trees, *Prospaltella berlesei* has passed through three periods: the first one of rapid diffusion in Italy; the second, one in which it reached its maximum; and the third, one in which some foci of infestation by the scale have reappeared. They are purely local, slight in extent, and produced by local circumstances unfavourable to the parasite, such as clouds of dust from motor traffic [*R.A.E.*, A, xiii, 57], and do not warrant any special measures.

HOULBERT (C.). **Thysanoures, Dermaptères et Orthoptères de France et de la faune européenne. II.**—16mo, viii + 357 pp., 15 pls., 46 figs., 15 pp. refs. Paris, Gaston Doin, 1927. Price Fr. 32.

This is the part of the work recorded previously [*R.A.E.*, A, xii, 138] that deals with the systematics of the Orthoptera. It contains keys to the groups, families, genera and species, descriptions of the more common species and notes on distribution. It was intended to include all the species of the European fauna, but those described within the last ten years are not mentioned, though many of the respective papers are quoted in the bibliography, which, however, only covers the period up to 1923. The nomenclature follows that of Kirby's Catalogue.

**La défense contre les sauterelles. "Stauronotes marocains" en Algérie en 1927.**—*Bull. agric. Algérie-Tunisie-Maroc*, xxxiii, no. 4, p. 78. Algiers, April 1927.

The communes in the departments of Algiers, Oran and Constantine in which egg-masses of the Moroccan locust [*Doclostaurus maroccanus*, Thnb.] have been found are enumerated. The preparations necessary for carrying out the campaign against this locust, in accordance with the law of 25th September 1919 [*R.A.E.*, A, vii, 544], have been made. The local committees will be assisted by crop protection guards trained

in the use of flame-throwers, and will also receive financial and other assistance from the Administration.

MOREIRA (C.). **Combatendo os insectos inimigos.** [Measures against injurious Insects.]—*Chacaras e Quintaes*, xxxv, no. 4, pp. 331-332. S. Paulo, 15th April 1927.

The Coccid, *Tectococcus ovalus*, produces leaf-galls on *Psidium araca* in Brazil. If the infestation is limited, collection of the affected leaves is the best measure, as the scale lives within the galls; otherwise spraying with oil emulsion is advocated. A lime-sulphur spray is advised against *Anuraphis* sp. on peach and *Aulacaspis pentagona* on apricot. Strips of material covered with adhesive hung on rose bushes near the buds will help to protect the leaves from the bee, *Melipona ruficrus*.

TORREND (C.). **Um modo curioso de limpar das pragas as laranjeiras.** [A curious Method of clearing Orange Trees from Pests.]—*Brotéria*, No. especial Agric., pp. 78-80. Caminha, 1927.

It is stated that an orange orchard in Brazil was cleared of a severe infestation by Coccids as a result of the introduction of spiders' nests from the countryside.

With regard to the use of an ant [*Azteca chartifex*] against thrips [*Heliothrips rubrocinctus*] infesting cacao, it is stated that the beneficial effect outweighs the disadvantage that it encourages scale insects [cf. R.A.E., A, xi, 90].

TAVARES (J. S.). **A cobrilha da cortiça.** [The Larva mining in Cork.]—*Brotéria*, No. especial Agric., pp. 81-86. Caminha, 1927.

The larvae of the Buprestids, *Coroebus undatus*, F., and *C. bifasciatus*, Ol., infest cork oaks in Portugal. When a new layer of cork of some thickness has formed on the barked trunk, the female oviposits in it, probably in cracks. The larva bores in it down to the cambium, where the sap is abundant, and makes a winding mine, parts of which lie in the inner surface of the cork layer and other parts in the external surface of the cambium. When the cork is removed the larva is unable to live in the trunk; it drops to the ground and either dies or pupates. When the new bark grows its outer surface is furrowed by the mines that occurred in the external surface of the cambium, and later on, its inside surface is injured by a fresh infestation. The adult beetles can be found from May to July on flowers in meadows. Besides depreciating the value of the cork, infestation often causes the death of the tree. No control measures seem possible, though sweetened poison-baits may perhaps be of use.

SILVELA (F.). **La "Ceratitis capitata" y la exportación de frutas.** [C. capitata and the Exportation of Fruits.]—*Bol. Agric. téc. y econ.*, Secc. doct., xix, no. 220, pp. 149-159, 5 refs. Madrid, April 1927.

This report by a technical member of the Spanish Embassy at Washington sets forth the views of the United States Government towards the importation of fruits likely to be infested by pests, such as *Ceratitis*

*capitata*, Wied. (Mediterranean fruit-fly), the occurrence of which in Spanish grapes led to the importation of the latter being prohibited. The question of cold storage as a means of destroying this pest is examined [cf. *R.A.E.*, A, xi, 570; xiv, 413], but the United States Government does not recognise this method as warranting the removal of the embargo.

LUCIANO (J.). **La mosca del Mediterráneo. El porqué debemos evitar la introducción de este insecto a nuestra isla.** [The Mediterranean Fly. The Reason why its Introduction into Porto Rico must be avoided.]—*Rev. Agric. Puerto Rico*, xviii, no. 3, pp. 143-144, 1 fig. San Juan, P.R., March 1927.

A brief account is given of the Mediterranean fruit-fly, *Ceratitis capitata*, Wied., and of the losses caused by it in the countries where it occurs, in view of the danger of its introduction into Porto Rico from Europe.

WALKER (M. N.) & STAHL (C. F.). **Certain Grass Hosts of the Sugar-cane Mosaic Disease and of the Corn Aphid considered in Relation to their Occurrence in Cuba.**—*Trop. Plant. Res. Foundn.*, Bull. 5, 14 pp., 1926. (Abstract in *Rev. App. Mycol.*, vi, pt. 5, p. 318. Kew, Surrey, May 1927.)

The observations of other workers on the grasses that serve as food-plants for *Aphis maidis*, Fitch (maize aphid) and those that are susceptible to sugar-cane mosaic are discussed in relation to the spread of the disease in sugar-cane. A list is given of all the cultivated and wild grasses hitherto recorded as food-plants of this Aphid and those susceptible to the disease, including notes on their occurrence in Cuba. It is believed that those present in that island are far more important as food-plants of the Aphid, the only known vector of mosaic in sugar-cane, than as sources of the virus.

Among cultivated grasses *Sorghum* is considered to be the greatest menace to sugar-cane in Cuba, as it is a preferred food-plant of *A. maidis* and very susceptible to infection by the disease; it should not be planted in the neighbourhood of sugar-cane fields. Although mature maize plants are frequently heavily infested by the Aphid, the authors have found it difficult to keep it alive on young plants for more than a few days. *Miscanthus sinensis* and *Tripsacum laxum* (Guatemala grass) are the only perennial species (apart from sugar-cane) that have been reported as susceptible to mosaic; the latter is grown for forage in Cuba, but the authors have not found it to be a favoured food-plant of *A. maidis*, and attempts to infect it with the disease have failed.

*Pennisetum purpureum*, a perennial species that is now being widely planted in Cuba, exhibits a mottling of the young unfolding leaves very similar to mosaic; this mottling, unlike mosaic, has been observed in Porto Rico to be transmitted by the seed and is regarded as a peculiarity of the plant, as attempts to infect it with mosaic have given negative results.

The two common annual weed grasses, *Echinochloa colonum* and *Syntherisma sanguinalis*, which are preferred food-plants of the Aphid and susceptible to mosaic, are regarded as the most important wild species in Cuba in connection with the transmission of the disease in sugar-cane.

CRAWFORD (H. G.) & MAHEUX (G.). **The European Corn Borer.**—*Quebec Dept. Agric.*, Bull. 92, 16 pp., 9 figs. Quebec, 1927.

The European corn borer [*Pyrausta nubilalis*, Hb.] was found in Quebec in 1926, following its rapid increase and spread in Ontario, and it is feared that it will soon extend throughout the Province. The present bulletin (which is issued in both French and English) presents the latest available information concerning the pest and its control. All farmers in infested districts are urged to take immediate precautions to keep the borer to the lowest possible numbers. Control can be maintained by complete disposal of the remnants of the crop (stalks, stubble and refuse) of one year before 1st June of the next year, either by turning animals in to feed, by deep ploughing or by burning. Owing to the moths' capacity for flight and consequent facility in dispersal, co-operation in control measures is essential if the pest is to be held in check.

MAHEUX (G.). **[Rapport de] l'entomologiste provincial.**—*Rapp. Min. Agric. Prov. Québec*, 1925-26, pp. 189-198, 2 pls. Quebec, 1927.

The more important among a number of troublesome pests recorded in Quebec during 1925 are dealt with. The most serious pest of vegetables was *Psila rosae* (carrot fly), which destroyed quite half the carrot crop and in some places ruined whole fields. The onion maggot, *Hylemyia antiqua* (*Phorbia ceparum*) is decreasing each year in consequence of the remedial measures undertaken [*R.A.E.*, A, xiv, 477]. *Diabrotica vittata* on cucumbers and *Phorbia cilicrura* (*fusciceps*) on beans and maize have done considerable damage in some localities. *Pegomyia hyoscyami* mined the leaves of spinach and beetroot, retarding the growth of the plants. *Barathra occidentata* attacked equally vegetables, shade and fruit trees, flowering plants and shrubs. *Saperda candida*, *Eriosoma* (*Schizoneura*) *lanigerum*, and *Hyphantria textor* were all troublesome in some orchards. Pests of bush fruits included the sawfly, *Pteronius ribesii*, *Myzus ribis* (red-currant aphid) and *Oberia bimaculata*, which was reported from the south of Montreal as attacking the stems of raspberries. *Illinoia* (*Macrosiphum*) *pisi* (pea aphid) infested some fields in large numbers. On birches there was a general infestation of *Bucculatrix canadensisella* (birch leaf-miner). *Paraclemensia acerifoliella* (sugar-maple leaf-cutter) continued the destruction it began on maples three years previously in the country south of Montreal. The damage is not at first apparent, as the leaves have a wonderful power of recovery, but any trees that are at all unhealthy succumb from repeated attacks.

The recent energetic campaigns against *Porthetria dispar* (gipsy moth) have apparently resulted in the complete extermination of this pest in Canada; no trace of it has been found in spite of thorough scouting.

GLENDENNING (R.). **The Cabbage Flea-beetle and its Control in British Columbia.**—*Canada Dept. Agric.*, Pamph. N.S. 80, 10 pp., 3 figs. Ottawa, April 1927.

Of the three species of flea-beetles of economic importance in the Lower Fraser Valley, British Columbia, *Phyllotreta albionica*, Lec. (cabbage flea-beetle), which is metallic green and without hairs on the back, is the only one causing damage to cruciferous crops. The others,

which are often confused with it, are *Psylliodes punctulata*, Mels. (hop flea-beetle), which is bronze in colour and without hairs on the back and feeds on mangel, hop, hemp, rhubarb, nettle, etc., and *Epitrix cucumeris*, Harr. (potato flea-beetle), which is dull bronze and covered with fine, short hairs and feeds on potato and tomato. The favourite food-plants of *P. albionica* are turnip (both rough and smooth-leaved) and radish, though cabbage, cauliflower, and other cruciferous crops and weeds are also infested. The only non-cruciferous plant known to be attacked is the garden nasturtium. The beetles emerge from hibernation in spring (late March and early April) and feed on warm, dry days for about 3 months, small holes first appearing in the leaf surface of the seedlings, followed by the entire destruction of the seed leaves and death of the young plants. Mating and oviposition take place during late April and May. After a pre-oviposition period of from 5 to 10 days, eggs are laid round the base of the plants, from 1–2 ins. below the soil surface, a female depositing about 60 in batches of from 15 to 20 during a period of 3 weeks. The incubation period probably varies between 15 and 21 days. During June and July the larvae feed on the roots of the food-plants, without, apparently, causing any appreciable damage. They then enter a pre-pupal period lasting from 10 to 12 days, the pupal stage lasting about 11 days. The pupae, in smooth earthen cells, are generally found nearer the surface of the soil than the larvae. The beetles begin to emerge in early August, and feed on the foliage for about 6 weeks, seeking hibernation quarters, which are generally among dry leaves under hedges or shrubs or along fence rows, in the latter half of September. Winter mortality seems never to rise above 10 per cent. Hoeing and cultivation probably expose and destroy numbers of the immature stages. A small Braconid parasite, *Perilitus epitricis*, Vier., was observed in 1923 and was found to have a life-cycle of three weeks. It was never numerous, however, and was not observed in 1926.

None of the usual insecticides for this class of insect proved successful against *P. albionica*, the chief reason being that all of them were too easily washed off from the smooth surface of cruciferous plants by heavy dews and rain. The beetles when hungry are not deterred from feeding by heavy coatings of Bordeaux mixture or other substances, but attack any small area that has not been covered by the spray. By far the best remedy tried was a dust composed of nicotine sulphate mixed with hydrated lime at a strength of 3 per cent. actual nicotine. This should be applied on warm days when the temperature is 70° F. or over. It should be mixed fresh for each application or kept in an air-tight container. Three applications in spring and one or two in August should keep the pest down to negligible numbers.

**Destructive Insect and Pest Act. Regulations : no. 3 (Foreign), 3rd Revision ; no. 4 (Foreign), 1st Revision ; no. 11 (Foreign), 2nd Revision ; no. 14 (Foreign), 2nd Revision. —Canada Dept. Agric. Ottawa, Ont., April 1927.**

These revisions are dealt with in the same order as in the title, each receiving a separate paragraph in the abstract.

To prevent the introduction of the potato tuber moth [*Phthorimaca operculella*], the importation of potatoes into Canada from Europe, the Azores, the Canary Islands, Newfoundland, the islands of St. Pierre and Miquelon, and California is prohibited.

To prevent the introduction of the Mediterranean fruit-fly [*Ceratitis capitata*], the importation of all non-canned fruits or plants into Canada from the Hawaiian Islands is prohibited, except the fruits of pineapple, banana and coconut, which may be imported after they have been inspected and certified by an officer of the U.S. Department of Agriculture to be free from infestation. All containers must be marked with the name and address of the consignor and of the consignee and must bear the original, or duplicate copy, of the certificate of inspection.

To prevent the introduction of the alfalfa weevil [*Hypera variabilis*], the importation into Canada of lucerne hay from California, Colorado, Idaho, Nevada, Oregon, Utah and Wyoming is prohibited, except when transported through these States on a through bill of lading. All shipments of lucerne hay consigned to Manitoba, Saskatchewan, Alberta and British Columbia must be accompanied by a certificate showing the State in which it was grown.

This 2nd Revision, directed against the introduction of the oriental peach moth [*Cydia molesta*], etc., and prohibiting the importation of peaches and peach nursery stock from certain of the United States, is the same as the 1st Revision [*R.A.E.*, A, xiii, 423], except that Tennessee is substituted for Arkansas.

DINGLER (M.). **Schutz gegen Tiere.**—HESS-BECK: *Forstschutz*, 5th edn., i, Lief. 1-5, pp. 1-480, 332 figs., refs. Neudamm, J. Neumann, 1927. Price M.4 per pt.

These are the first five parts of the first volume (which deals with animal pests of forests in Germany) of the Hess-Beck encyclopaedia of forest protection. The chief section deals with insect pests and begins in part 2 with general notes on the damage they cause, on such natural enemies as other insects and birds, and on artificial control measures. The insects are then discussed individually, the Coleoptera covering pp. 170-349, the Hymenoptera pp. 349-378, and some of the Lepidoptera pp. 378-480. Each species is described, with an account of its biology, the injury it does, and full notes on its control.

BLUNCK (H.). **Können Erdflöhe durch Stäubemittel wirksam bekämpft werden?** [Can Flea-beetles be combated successfully with Dust Preparations?]  
—*Landw. Wochenbl. Prov. Schleswig-Holstein*, no. 19, reprint, 2 pp. Kiel, 13th May 1927.

The Halticid beetles that infest cruciferous plants are repelled by road-dust, soot or ashes, but their effect lasts only until they are washed off by rain. Chemical manures in dust form and proprietary repellent dusts are similar in action. The proprietary dust insecticides recommended against these pests are costly and therefore only suitable for use in special cases. Liquid insecticides are little better, as the beetles avoid the parts of the foliage that are covered with arsenicals, while substances, such as nicotine, that are also respiratory poisons are effective, but so dear that their general use is impossible. In the field, the only practical measures are those that assist the growth of the plants, so that they may rapidly pass through the critical stage.

FRIEDRICH (K.). **Die Bedeutung der Biocönosen für den Pflanzenschutz gegen Tiere.** [The Importance of the Balance of Life for the Protection of Plants against Animals.]—*Zeitschr. angew. Ent.*, xii, no. 3, pp. 385–411, 62 refs. Berlin, April 1927.

A brief account of this address has already been noticed [*R.A.E.*, A, xiv, 614]. Emphasis is placed on the effect of cultivated crops in upsetting the balance of life and so giving rise to outbreaks of pests.

KLEINE (R.). **Fritfliegenbefall und Kornqualität.** [Infestation by the Frit Fly and the Quality of the Grain.]—*Zeitschr. angew. Ent.*, xii, no. 3, pp. 412–427. Berlin, April 1927.

This paper gives the results of investigations in 1924 on the infestation of cereals by the frit fly [*Oscinella frit*]. The results of work in previous years [*R.A.E.*, A, xi, 341; xii, 293] and in 1925 [xiv, 382] have already been noticed. The conclusions reached are that there may be considerable loss in the quantity and quality of the grain without any outward indication, and that attack by the second generation of the fly may be as injurious as that by the first. This late infestation is probably the reason for the many empty ears in late-sown oats. Barley is scarcely attacked in northern Germany and should be used there for late sowings instead of oats. The results also show that it should be possible to obtain varieties of oats resistant to attack by the second generation, as has been done for the first.

SEITNER (M.). **Aus der Praxis der Kiefernspinnerbekämpfung.** [The Control of *Dendrolimus pini*.]—*Zeitschr. angew. Ent.*, xii, no. 3, pp. 428–435. Berlin, April 1927.

A brief account is given of an infestation by the pine moth [*Dendrolimus pini*] in 1916–1919 of stands of black pine [*Pinus laricio*] east of Vienna. This pine seems better able to survive the attack than the white pine [*P. strobus*].

The outbreak was ended by natural enemies, regarding which a number of observations were made. The Chalcid, *Tetrastichus xanthopus*, develops in numbers (up to 2,000) in the pupa of the moth and is of frequent occurrence. The larva hibernates in the pupa of the host. There are two generations a year, the adults occurring in June–July, and again a month later. Many females oviposit in a single host pupa, and fresh pupae without their cocoons were readily accepted. In the summer generation the egg stage lasted 3 days, the larval 10–12, and the pupal 11–12. The resultant adults soon oviposit, but the larvae of the winter generation do not pupate until the following year. It was found that unfertilised females produce males only. Female pupae are more commonly parasitised, because the more active male pupae defend themselves by active movements that often kill the parasite.

*Pimpla bernuthi* is an external parasite of *D. pini*, exclusively confined to the pre-pupal stage in the cocoon. It is on the wing in March and April. The larva, which hatches four days after oviposition, only feeds for ten days and then spins a cocoon in which it remains for nearly a year, pupating in the following March. These data refer to the parthenogenetic reproduction observed, with a resultant male progeny.

The Tachinid, *Blepharipa scutellata*, is the most important parasite of *D. pini*, and is capable of checking the moth without other aid. Its larva is mature in July and pupates in the ground, the adult emerging in the following May. Of the parasites of this Tachinid, *Phygadeuon variabilis* is the most important; it was only obtained from Tachinid pupae collected in the ground and never from larvae obtained direct from caterpillars or pupae. The larva of *B. scutellata* only leaves its host by night. This seems to indicate that *P. variabilis* is active at night and attacks the Tachinid larvae as they attempt to burrow underground.

The Torymid, *Monodontomerus dentipes*, which has been regarded as a parasite of *D. pini*, is really a hyperparasite. It attacks *Rhogas* spp., *Pimpla* spp., *Exochilum giganteum*, *Theronia atalanta* and *Tetrastichus xanthopus*.

SPRENGEL (L.). **Untersuchungen über die Gradation des Heu- und Sauerwurmes** (*Clysia ambiguella* Hüb. und *Polychrosis botrana* Schiff.). [Researches on the Increase, Maximum Occurrence and Decrease of the Spring and Summer Generations of *C. ambiguella* and *P. botrana*.]—*Zeitschr. angew. Ent.*, xii, no. 3, pp. 436–456, 15 figs., 21 refs. Berlin, April 1927.

As a result of the severe outbreak of *Clysia ambiguella*, Hb., in the Rhine Palatinate in 1925 and the organisation of measures on a large scale in 1926 [*R.A.E.*, A, xiv, 136, 376], an extended series of observations on the factors affecting outbreaks of this vine-moth was made in 1926. The data obtained in two localities are given by means of curves and detailed notes.

*Polychrosis botrana*, Schiff., was too scarce for adequate records to be made. The first adults of *C. ambiguella* occurred on 29th April, and the last on 31st August, with an interval of 59–72 days between the two flights, including the whole of June. The spring flight lasted up to 9 days, and the summer one up to 21 days, with a minimum of 18. The first generation was less numerous than the second.

It has been thought that the presence of many pupae in winter implies a severe infestation in spring, and that a small spring generation implies a small summer one, but the data obtained show a contrary result. Unfavourable weather conditions are the reason for the differences noted, and it is now evident that in Germany the abundance of *C. ambiguella* and *P. botrana* depends on weather conditions. The prediction of outbreaks is thus impossible, which emphasises the practical value of bait-traps as indicators for the correct timing of applications of insecticides.

ARNHARDT (L.). **Oesterreichischer Lärchenhonigtau, Lärchenmanna und Lärchenhonig**. [Austrian Larch Honeydew, Larch Manna and Larch Honey.]—*Zeitschr. angew. Ent.*, xii, no. 3, pp. 457–472, 7 figs. Berlin, April 1927.

Larch manna is found in Austria in districts where there are considerable stands of *Larix europaea*. It results from the natural evaporation, crystallisation, etc., of the honeydew produced by an Aphid, here described as *Lachnus muravensis*, sp. n. Larch honey is produced by bees from the honeydew.

BODENHEIMER (F. S.). **Ein Befall von *Evetria buoliana* var. *thurificana*, Led., in Pinienbeständen des Karmel.** [An Infestation of *E. buoliana* var. *thurificana* in Pine Stands on Mount Carmel.]—*Zeitschr. angew. Ent.*, xii, no. 3, pp. 473–483, 4 figs., 5 refs. Berlin, April 1927.

An infestation by *Rhyacionia* (*Evetria*) *buoliana* var. *thurificana*, Led., of a stand of about 20 acres of *Pinus pinea* sown in 1919 and 1920 occurred in 1923–1926 on the north-west slope of Mount Carmel. The trees recovered from the attacks, and this pest does not appear to warrant the expense of cutting off infested shoots, provided that the pines are growing on suitable soil and are well looked after generally. The moth has occurred also near Haifa and Jaffa on both *P. pinea* and *P. halepensis*, the infestation on the latter being very slight. There are two distinct generations in Palestine, the first occurring from April to early September and the second from mid-September to early April. The variety *thurificana* is found only in southern Spain, Cyprus and Palestine, and this range seems to agree with that of the two annual generations.

ESCHERICH (K.). **Die Bekämpfung des Kaffeeborkenkäfers im Staate São Paulo.** [The Control of the Coffee Beetle in the State of S. Paulo.]—*Zeitschr. angew. Ent.*, xii, no. 3, pp. 493–498, 4 figs., 3 refs. Berlin, April 1927.

This paper on the work organised and successfully carried out in the state of S. Paulo, Brazil, against the coffee berry borer, *Stephanoderes hampei*, Ferr. (*coffea*, Hag.), is substantially the same as one already noticed from another source [*R.A.E.*, A, xv, 30].

ZWÖLFER (W.). **Die Pebrine des Schwammspinners und Goldafters, eine neue wirtschaftlich bedeutungsvolle Infektionskrankheit.** [The Pebrine of the Gipsy Moth and of the Brown Tail Moth, a new Infection of economic Importance.]—*Zeitschr. angew. Ent.*, xii, no. 3, pp. 498–500. Berlin, April 1927.

A pebrine that attacks the larval, pupal and adult stages of the gipsy moth [*Porthetria dispar*] and brown tail moth [*Nygmia phaeorrhoea*] and appears to be of considerable importance in checking these pests, is due to a microsporidium ingested by the larva, here described as *Plistophora schubergi*, sp. n. As a rule the infection entails the death of the host in the larval stage. Infections of 70, 84 and 94 per cent. of the caterpillars have been observed, and this disease seems much more effective than the polyhedral infection in reducing their numbers.

VIETINGHOFF VON RIESCH (A. Frhr. von). **Magenanalysen heimischer Vögel als Bausteine zur Erkenntnis des Verhältnisses zwischen Vogel und Insekt.** [Stomach Analyses of German Birds as a Basis for the Determination of the Relation between Bird and Insect.]—*Zeitschr. angew. Ent.*, xii, no. 3, pp. 504–507. Berlin, April 1927.

This is a further list [*cf.* *R.A.E.*, A, xiii, 481] of examinations of the stomachs of 39 birds of various species found in Germany.

D[USSEERRE] (C.). **Utilité des engrais chimiques pour la destruction de certains parasites des cultures.**—*Terre vaudoise*, xix, no. 15, p. 238. Lausanne, 9th April 1927.

Chemical fertilisers have considerable value in destroying cockchafer larvae [*Melolontha*] in the soil. The chlorides contained in potash manures circulate with moisture in the soil and reach hibernating larvae well below the surface, whilst a top dressing of ammonium sulphate or sodium nitrate in the spring will account, by the corrosive action of the salts, for any that may have escaped the winter treatment. Animal or vegetable manures should not be used simultaneously with chemical fertilisers as they favour the development of various insects.

ROLET (A.). **Pour défendre les arbres fruitiers contre les chenilles.**—*Vie agric. & rur.*, xxx, no. 18, pp. 278–286, 7 figs. Paris, 1st May 1927.

The more important Lepidopterous pests of fruit trees in France are enumerated, with brief reference to sawflies and other orders, notes being given on the injuries inflicted. The various measures that may be employed for their control are discussed.

**La lavande-aspic contre l'eudémis.**—*Progrès agric. & vitic.*, lxxxvii, no. 19, p. 455. Montpellier, 8th May 1927.

In one locality vines situated on the windward side of lavender distilleries have been free from attacks by the vine-moth [*Polychrosis botrana*, Schiff.] for three years in succession. This is thought to be due to the action of smoke from the furnaces, which are stoked with the residue from the distillation. In experiments on the larvae extracts of lavender showed some insecticidal value.

**Les émulsions de pétrole contre l'eudémis.**—*Progrès agric. & vitic.*, lxxxvii, nos. 20 & 21, pp. 481, 503–504. Montpellier, 15th & 22nd May 1927.

Instructions are given for making an emulsion containing 1–2 per cent. kerosene in which soap is used as the emulsifier. This spray has been found effective against the first generation of the vine-moths [*Polychrosis botrana*, Schiff., and *Clysia ambiguella*, Hb.] in France. A mixture of copper sulphate and lime may be added if a fungicide is also required.

GRASSÉ (P. P.). **A propos d'une invasion de ver gris.**—*Progrès agric. & vitic.*, lxxxvii, no. 21, pp. 509–512. Montpellier, 22nd May 1927.

An account is given of a severe outbreak of Noctuid larvae, probably *Feltia exclamationis*, L., on vines in one locality in France. The injury is described, and a brief life-history is given. The moths are on the wing in the summer, and hibernation occurs in the larval or sometimes possibly in the egg stage. The larvae only attack vines occasionally, and the damage is serious only in localities where a single crop is grown.

Lack of grass would appear to be the cause of migration to vines, but in this instance observations showed that the caterpillars deliberately avoided tufts of low vegetation and persistently attacked the most leafy vine stocks. The infested vineyards were, with one exception, in the vicinity of grass-lands surrounded by trees, and the author considers that the moths had migrated from these fields the previous year and oviposited on the vines. The curious localisation of the damage, which was limited very exactly in some cases by the boundaries of estates, was probably due to varying agricultural practices; the time of cultivation and the use of various fertilisers, such as crude ammonia and calcium cyanamide, may play some part in the control of the caterpillars.

The spraying of the vine stems with arsenicals as they come into leaf is not so effective in practice as might be expected, since the spray acts as a repellent and the caterpillars only attack the new tips of shoots not covered by it. The use of diplumbic instead of triplumbic lead arsenate is recommended, as the latter has been found less effective against certain insects. It is desirable to insist that the arsenical content of commercial pastes, which is variable, should be indicated by the manufacturer. The following poison bait, which was successfully used against crickets, might prove effective against the larvae of *F. exclamationis*: 20 lb. bran well mixed with 1 lb. arsenic, to which 4.8 pts. water containing 3.2 pts. molasses are added at the time of using, the whole being coloured green. This bait is spread in the evening at the rate of one handful to each vine stock. The use of poultry in the vineyards is recommended, as fowls feed very readily on these caterpillars.

[VUKASOVIĆ] VOUKASSOVITCH (P.). **Sur deux Diptères parasites: *Siphonella ruficornis*, Macq. (= *nucis*, Perris) et *Discochaeta cognata*, Schiner (= *hyponomeutae*, Rond.).—Bull. Soc. Hist. nat. Toulouse, liv, pt. 2, pp. 219–222, 5 refs. Toulouse, 30th June 1926.**

A Chloropid identified by Dr. Villeneuve as *Siphonella ruficornis*, Macq., hitherto known as a pest of nuts, was bred by the author from larvae that fed as external parasites on larvae of *Hoplocampa*, presumably *H. brevis*, Klug, and *H. fulvicornis*, Panz. (*minuta*, Christ), in pears and plums, respectively, near Belgrade. More than 50 per cent. of the crop of these fruits was infested in 1925, but though many of the sawfly larvae were parasitised by an Ichneumonid, *S. ruficornis* was very rare.

A Tachinid, *Discochaeta yponomeutae*, Rond. (*cognata*, Schin.), which according to Stein is not a synonym of *D. euonymellae*, Ratz., as considered by some authors, was the most important parasite of *Hypomeuta* (*Yponomeuta*) *malinellus*, Zell., a serious outbreak of which occurred on apple in central Serbia in 1925. Some of the larvae of *D. yponomeutae* emerged from the host larvae when they were beginning to spin their cocoons, and pupated in the threads of the nest; some emerged after the completion of the host cocoons, within which they pupated; and some pupated within the pupal skin of the host. An examination of 1,644 cocoons of *H. malinellus* from 10 nests showed that 864 moths, 121 parasitic Ichneumonids and 367 *D. yponomeutae* had emerged, while 249 larvae and pupae of *H. malinellus* and 43 Ichneumonid larvae had been killed by Chalcids.

VECCHI (A.). **Alcune notizie sull' *Ephestia elutella*.** [Some Notes on *E. elutella*.]—*Boll. Soc. ent. ital.*, lix, no. 4, pp. 50-58, 2 figs., 2 refs. Genoa, 30th April 1927.

*Ephestia elutella* has been observed in Italy ovipositing on dead but not yet desiccated individuals of *Apis ligustici*, the larva feeding in the bees. A detailed description of the larva is given, as this stage does not appear to have been fully described before.

**Progress Report, January and February 1927.**—*Trinidad & Tobago: Min. & Proc. Froghopper Invest. Comm.*, pt. vi, pp. 144-146 & 158-160. Trinidad, 1927.

A new method of assessing the distribution of eggs of the froghopper [*Tomaspis saccharina*] in cane fields that are being reaped is to cut shavings from the stools with a carpenter's adze. This will enable many samples from any field to be collected in a short time, will reduce the sampling error and will greatly expedite the study of the dry season phase of the life-cycle.

*Crotalaria* [usaramoensis] introduced as a cover crop, is growing satisfactorily but, as expected, is being attacked by the caterpillar of *Utetheisa ornatix*.

BRITON-JONES (H. R.). **Note on Mr. E. B. Smith's Suggestions for Froghopper Control.**—*Trinidad & Tobago: Min. & Proc. Froghopper Invest. Comm.*, pt. vi, pp. 147-148. Trinidad, 1927.

Comments are made by the author on suggestions recently made with regard to the control of the froghopper [*Tomaspis saccharina*] [R.A.E., A, xv, 178]. Dealing with the question of the origin of the first generation of the froghopper, its migration in the wet season and aestivating quarters in the dry season, the author points out that if a field is very badly infested by the first or second generation, the adult females appear to migrate to a fresh field before ovipositing. Completely destroyed fields are never used for this purpose, and thus a field that has been badly infested by the second or third generation often escapes damage by the first generation of the following year. The relative liability of ratoon and plant cane to infestation depends rather on the condition of growth than on the age of the stool from which the young growth arises. The presence of first generation froghoppers in numbers on the oldest available ratoon canes is chiefly due to the fact that the stools of these canes are the main aestivating quarters of the insect from one season to another, and the older the ratoon the bigger the stool and the more insects it can harbour. Regarding the proposed artificial dissemination of green muscardine fungus [*Metarhizium anisopliae*], the author suggests that it will be necessary to carry out further work with this fungus before its value can be proved. He thinks it very doubtful whether the proposed irrigation of fields where attack is developing would be successful. The date of application of irrigation water, as with heavy rainfall, is of the greatest importance. Rainfall sufficient to submerge the land when the froghopper is in the spittle stages does a great deal of good, but similar floods when the insect is on the wing increase the damage. Dry season irrigation and flooding the land at critical periods will upset the life-cycle of the insect and so prove beneficial. Irrigation sufficient to moisten the soil at the time suggested by Mr. Smith might, however, be highly injurious.

URICH (F. W.). **History of Sugar-cane Blight in Trinidad from 1920-1924.**—*Trinidad & Tobago: Min. & Proc. Froghopper Invest. Comm.*, pt. vi, pp. 149-152. Trinidad, 1927.

Continuing the previous record of infestation by the sugar-cane froghopper [*Tomaspsis saccharina*] in Trinidad up to the year 1919 [R.A.E., A, ix, 261], the author reviews the situation during 1920-1924. Infestation was fairly heavy in 1920, but there was very little in 1921, and controlling agents, including the green muscardine fungus [*Metarrhizium anisopliae*], were so active that it was not until 1924 that the froghoppers were able to increase to really dangerous numbers. During this interval, the relation of froghopper incidence to rainfall was consistent with experience in the past. The extent of the damage in the various districts in 1924 is shown in a table. If these figures are compared with those of previous years, there is found to be a gradual decrease in the area of severe infestation (from 5,143 acres in 1912 to 1,906 acres in 1924) with a marked improvement during 1924 in the northern section. The resistance of different varieties of cane is discussed. The ratoons of all seedling varieties invariably suffer more than the plants.

BRITON-JONES (H. R.). **Suggestions for (1) Flooding Cane Fields and (2) Growing only Plant Canes, in connection with Froghopper Control.**—*Trinidad & Tobago: Min. & Proc. Froghopper Invest. Comm.*, pt. vi, pp. 161-163. Trinidad, 1927.

The sugar-cane areas of Trinidad can be divided into two classes, namely, lands that, owing to their height above sea level, can be flooded early in the wet season by holding up the surface water instead of immediately draining it away, and lands that cannot be flooded at any time in the season. In the former case, flooding will disturb the nymphs of the froghopper [*Tomaspsis saccharina*] and force them above-ground, and when, after 3 or 4 days, the water is drained off, they will either perish or can be destroyed by the application of an insecticide.

If the practice of ratooning cane could be abolished, it is almost certain that the froghoppers could be reduced to negligible numbers; this, however, could not be accomplished in Trinidad in one or even two seasons, and it would be unwise to do it until it was proved by trial to be a financially sound method. The author believes that the chief factor deciding the severity of outbreaks in different seasons is the rainfall in the dry season and at critical periods in the wet season when the insect is in the nymphal stages. The argument against growing plant canes only is the cost of production. The proposal is made that a block of 100 acres should be divided into two equal areas and run for 5 years in a manner described, which would result in the one block yielding one crop every 18 months followed by 3 months' fallow and 3 months under a cover crop, while on the other block there would be a crop every year, so that all the cane would not come to the factory at the same time. After 5 years the ratoon system might be reverted to for a few years until the froghopper had again reached numbers requiring the reversion to plant cane only. It is possible that the yield of plant cane might be increased by planting the cane closer than when ratooning is intended.

Mr. J. S. Dash, whose comments on the above proposals were published in Part v of this publication (pp. 132-133), submits that the practicability

of flooding depends on the amount of rainfall, and questions whether flooding could be carried out with the regularity that the suggestion entails for it to be economically efficient, and over a sufficiently large area to warrant its application. Moreover, unless the flooded lands remain submerged during the rainy season, grass would probably become established on them before a cover crop could be sown, while continuous and protracted water-logging might possibly prove detrimental to the crop. With regard to the elimination of ratoons, it has long been recognised that these should be kept within reasonable limits, but complete elimination depends on the labour available and the possibility of finding crops that can be grown subsidiary to cane and that will yield financial profit. Moreover, well grown ratoons frequently give as good or heavier returns than plant canes. There may prove to be considerable difficulty in reaping large areas of cane in a limited time and preparing that land again for cane in the face of many uncontrollable factors, and a scheme that may prove successful on a small scale may not be profitable on large areas. Experiment has shown that there is nothing to be gained by planting the cane closer, in fact the greater expenditure may involve a loss. With an increase in plant cane it will be necessary to maintain cover crops or keep fallow lands free from grass. The most rigid co-operation is necessary in regard to field practice.

DE VERTEUIL (J.) & URICH (F. W.). **Report on Froghopper Blight in 1925.**—*Trinidad & Tobago: Min. & Proc. Froghopper Invest. Comm.*, pt. vi, pp. 164–172. Trinidad, 1927.

This report on the outbreak of the froghopper [*Tomaspsis saccharina*] in Trinidad in 1925 is compiled from data collected by W. Nowell and consists largely of a number of tables showing the acreage affected (3,796 acres severely infested and 2,787 acres more lightly), the damage to plant canes as contrasted with ratoons, and the different effect on seedling varieties and Uba cane. There is no doubt that plant canes hardly ever suffer to the same extent as ratoons. Weather conditions were favourable to the froghopper, and in August and September the infestation was heavy. The green muscardine fungus [*Metarrhizium anisopliae*] was active in July and more so in November; *Empusa* was observed on some estates.

SMITH (C. O.). **La lucha contra la pulga del tabaco.** [Work against the Tobacco Flea-beetle.]—*Rev. Indust.*, iii, no. 34, p. 397. Bogotá, March 1927.

The use of a dust of lead arsenate and Paris green is advised against *Epitrix parvula*, infesting tobacco in Colombia [*R.A.E.*, A, xiv, 17].

**Nursery Stock, Plant and Seed Quarantine. Notice of Quarantine no. 37, with Revised Regulations.**—*U.S. Dept. Agric., Fed. Hortic. Bd.*, 10 pp. Washington, D.C., 17th March 1927.

The quarantine regulations and amendments previously issued [*R.A.E.*, A, vii, 184; xiii, 238, 269; xiv, 162, etc.] are incorporated in one document, and minor alterations are made in certain of the regulations, taking effect on 1st April 1927.

BRADBURY (O. C.). **Some Phases of the Embryology of the Carnation Mite.**—*Jl. Elisha Mitchell Sci. Soc.*, xlii, no. 1-2, pp. 94-98, 3 pls., 7 refs. Chapel Hill, N.C., October 1926.

The mite, *Pediculopsis graminum*, Reuter, is found in the buds of carnations, being usually associated with the fungus, *Sporotrichum poae*, which causes bud-rot. The spores of the fungus are apparently carried into the buds on the bodies of the mites. In most mites the development takes place from an egg deposited by the mother, but in this species the young go through their entire development in the mother's body.

BRANNON (C. H.). **The Relation of Temperature, Light and Humidity to the Behavior and Longevity of a Joint Worm Parasite (*Eurytoma* sp.).**—*Jl. Elisha Mitchell Sci. Soc.*, xlii, no. 1-2, pp. 99-108, 3 figs. Chapel Hill, N.C., October 1926.

A species of *Eurytoma* is a valuable parasite of *Harmolita tritici*, Fitch, which is very destructive to wheat in certain sections east of the Mississippi. Most of the larvae of the host pupate in early autumn and hibernate as pupae, the rest in early spring. Adults emerge in May and lay their eggs just above the second or third joint in the wheat, the young larvae feeding in the stem. There is only one generation a year. The eggs hatch in about 10 days, and the larvae mature in about three weeks. Males occur normally, but the species will breed parthenogenetically.

The life-history of the parasite is practically the same as that of the host, but it usually emerges earlier. The author, therefore, carried out experiments, which are discussed in some detail, to determine the best means of keeping the adults alive and in good condition until their host should be available. It is not known on what they feed in the field, probably on nectar of flowers, but all efforts to keep them alive in as near normal conditions as possible proved unsuccessful. Keeping them, however, in a dormant condition in a damp cellar at a temperature of 50° F. in absolute darkness seemed to meet all requirements.

ROHWER (S. A.). U.S. Bur. Ent. **Two European Sawflies of the Genus *Emphytina* found in the United States (Hym.).**—*Proc. Ent. Soc. Wash.*, xxix, no. 3, pp. 66-67. Washington, D.C., 21st April 1927.

The synonymy of *Emphytus* (*Emphytina*) *tener*, Fall., which pupates in the ends of pruned twigs of apple and other plants, and of *E. (E.) pallipes*, Spin., the larvae of which feed on the leaves of violet, is discussed. One of the names under which the former has been described in the United States is *Simplemphytus pacificus*, MacGill. [*R.A.E.*, A, iii, 77, 260], while the latter has been known in North America as *E. canadensis*, a name that was proposed by Kirby for specimens described as a new species by Provancher under the name of *E. pallipes*.

ROHWER (S. A.). U.S. Bur. Ent. **On the Synonymy of a Leaf Mining Sawfly.**—*Proc. Ent. Soc. Wash.*, xxix, no. 3, pp. 67-69. Washington, D.C., 21st April 1927.

MacGillivray divided a group of sawflies of the genus *Metallus* feeding on blackberries into two species, *M. rubi*, Forbes, and *M.*

*bethunei*, MacGill., but examination of a number of specimens has shown that the characters on which they were based are variable, and it seems fairly certain that the name *bethunei* was proposed for individual variants and must sink as a synonym.

In a paper previously noticed [*R.A.E.*, A, xi, 293] Yuasa described a larva distinct from *M. rubi* as that of *M. bethunei*, but it seems probable that his specimens were incorrectly identified, as larvae from Ontario, associated with adults of *M. bethunei*, agree with larvae associated with adults of *M. rubi* in New York and with published descriptions of the latter.

PATCH (E. M.). **Two Currant Aphids that migrate to Willow-herbs.**—*Maine Agric. Expt. Sta.*, Bull. 336, 8 pp., 1 pl., 1 fig. Orono, Me., January 1927. [Recd. May 1927.]

Descriptions are given of the individuals of the various generations of two Aphids attacking both currant and gooseberry (*Ribes*) in Maine, *Aphis varians*, Patch (variable currant aphid) and *A. sanborni*, Patch (green gooseberry aphid), the seasonal history of which has already been described [*R.A.E.*, A, ii, 510].

In 1921 the author established the fact that the summer food-plant of these species is willow-herb (*Epilobium*). Winged individuals of *A. varians* about to migrate from *Ribes* were placed on *E. angustifolium* and *E. coloratum*, on which they thrived, the young deposited being similar to those commonly found on willow-herb during the summer. In the late summer or autumn winged females return to *Ribes* and establish colonies in which wingless oviparous females develop. These mate with winged males that fly from the willow-herb and subsequently deposit the overwintering eggs on currant and gooseberry bushes.

Similar experiments were carried out with *A. sanborni*, the plants used being *Epilobium lineare*, *E. coloratum* and *E. adenocaulon*. The Aphids were found colonising these same species in the field.

A spray containing 40 per cent. nicotine sulphate at the rate of  $\frac{3}{4}$  U.S. pt. to 100 U.S. gals. of soft water in which 4-5 lb. of soap have been dissolved is recommended for use against these Aphids in autumn and spring. After hatching from the winter eggs they are present on the bushes for more than a month before migration takes place, but as the infested leaves soon become distorted in such a way as to protect the Aphids, an early application is desirable. In summer the destruction of willow-herb plants in the vicinity of currant gardens is, in some localities, a practical measure.

A list of the Aphids found on currant and gooseberry is given.

WAKSMAN (S. A.). **Principles of Soil Microbiology.**—8vo, xxviii+897 pp., 19 pls., 77 figs., numerous refs. London, Baillière, Tindall & Cox, 1927. Price 45s.

This comprehensive work, which the author states in the preface to be a collection of known facts and a study of the literature concerning micro-organisms found in the soil and their activities, includes a chapter on the non-protozoan fauna of the soil, which contains a useful summary of information on the Nematodes and insects that occur in the soil and methods of studying them, and a paragraph on food-plant selection and specialisation by Nematodes.

HOWARD (N. F.). **Correlation of Mexican Bean Beetle Population with original Forest Type.**—*Science*, lxx, no. 1690, pp. 499–500, 2 refs. New York, N. Y., 20th May 1927.

*Epilachna corrupta*, Muls., was first discovered in Ohio in 1923, having spread from northern Alabama in three years. In 1924 and 1925 it was abundant in the southern third of Ohio and scarce in the remainder. It appears that there is a striking correlation between a map showing the economic damage done by this beetle and one of the original mixed mesophytic forest prepared by Drs. E. N. Transeau and H. C. Sampson and as yet unpublished. Damage to the bean crop in Ohio was confined to the habitat originally occupied by this forest in the southern third of the State, with the possible exception of two restricted infestations. In 1921 the preferred habitat in the South-eastern States [*R. A. E.*, A, x, 530] appeared to be the slopes and valleys of the mountainous or hilly regions. Studies of evaporation and climate are being undertaken with the object of analysing the observations made, and to ascertain if such work may be of value in affording an index for use in forecasting the limits of economic damage of an introduced insect pest.

WOMERSLEY (H.). **Insect Pests and their Biological Control.**—*Ann. Rept. & Proc. Bristol Nat. Soc.*, (4) vi, no. 4, pp. 297–302. Bristol, 1926.

This is a popular account of insect parasites and their use in the biological control of agricultural pests and includes notes on a number of those that have been introduced into Hawaii.

GIRAULT (A. A.). **Notes on Australian Thysanoptera. Recording Australian Thysanoptera.**—*Insector Inscitiae Menstruus*, xiv (1926), no. 10–12, pp. 189–190. Washington, D. C., 11th April 1927.

These records of Queensland Thysanoptera include *Pseudanaphthrips achætus*, Bagn., *Thrips lacteicarpus*, Gir., *T. imaginis*, Bagn., and *Physothrips cinctipennis*, Bagn., on white clover [*Trifolium repens*], *T. tabaci*, Lind., *T. imaginis*, *Neophysopus fragariae*, Gir., and *P. achætus*, on strawberry, and *Plesiothrips perplexus*, Beach, an introduced species, on maize.

COTTON (R. T.). **A Calendrid Weevil Visitor from Japan.**—*Proc. Ent. Soc. Wash.*, xxix, no. 4, pp. 93–94, 1 fig. Washington, D. C., 18th May 1927.

Four specimens of a weevil, *Calandra* (*Myocalandra*) *clongata*, Roelofs, which closely resembles *C. (Sitophilus) oryzae*, L., were intercepted at Vancouver in a shipment of bamboo from Japan, and an additional specimen was taken at Seattle in a shipment of Japanese lily bulbs from Yokohama. This species, which has been observed in Japan living in small pieces of bamboo and also in flour and macaroni, probably breeds in bamboo and only accidentally infests other commodities. A free translation of the original description is appended.

MORRILL (A. W.). **Description of a New Cotton-infesting Species of *Bucculatrix* (Lepidoptera).**—*Proc. Ent. Soc. Wash.*, xxix, no. 4, pp. 94–98, 8 figs. Washington, D.C., 18th May 1927.

The egg, second and third stage larvae, and adult of *Bucculatrix gossypiella*, sp. n., are described from Mexico, where it feeds on varieties of cultivated cottons as well as various native species of *Gossypium*.

FROST (S. W.). **Beneficial Insects trapped in Bait-pails.**—*Ent. News*, xxxviii, no. 5, pp. 153–156, 1 chart, 1 ref. Philadelphia, Pa., May 1927.

During 1926 records were kept of beneficial insects captured in 430 bait-pails in a peach orchard in Pennsylvania, used in experiments against *Cydia* (*Laspeyresia*) *molesta*, Busck (oriental peach moth). With the exception of Chrysopids no beneficial insects were trapped in any abundance, but *Adalia bipunctata*, L., and other Coccinellids, and Syrphids, including *Ferdinandea dives*, O.S., *Volucella vesiculosa*, F., *Syrphus ribesii*, L., *Mesogramma polita*, Say, and *M. marginata*, Say, were trapped in small numbers, the Syrphids being attracted mainly by low-grade molasses. Bees were also trapped in small numbers, especially during the warmer part of the summer, in August and September; they were attracted by sugar baits and weak acids, but very little by molasses. Five pails containing high-grade molasses bait that was kept fresh were placed among quince trees, within 10 feet from bee-hives, and trapped only three bees between 5th May and 18th August, so that it appears that molasses baits can be used near bee-hives quite safely. A Hemerobiid was trapped in small numbers in the late summer, and *Chrysopa nigricornis*, Burm., *C. rufilabris*, Burm., and *C. quadripunctata*, Burm., were trapped in large numbers throughout the greater part of the summer, being attracted especially by sugar and molasses baits. As regards the economic importance of the destruction of Chrysopids there is some doubt, as it is not definitely known that the adults are predacious, and it would be necessary to know the percentage of gravid females caught before coming to any conclusion. A chart and a table are given, showing the comparative numbers of Syrphids, Hemerobiids, Chrysopids and bees trapped in the bait-pails throughout the summer, and the numbers trapped in the different baits.

PATCH (E. M.). **The Pea Aphid in Maine.**—*Maine Agric. Expt. Sta.*, Bull. 337, pp. 9–20, 1 fig., 19 refs. Orono, Me., February 1927. [Recd. May 1927.]

A severe infestation of *Illinoia pisi*, Kalt., on peas occurred throughout Maine in 1926, records indicating that the crop was 70 per cent. less than the average for the preceding three years. The bionomics and seasonal history of this Aphid are discussed [*R.A.E.*, A, iv, 33, 339, etc.]; in Maine the winter is passed only in the egg stage. The characters distinguishing this species from *Macrosiphum pisi*, Koch, (*I. solanifolii*, Ashm.) are described. A list of the food-plants in Maine is given, and a note on the part played by this Aphid in the transmission of mosaic disease is quoted [*R.A.E.*, A, xiv, 164].

Control methods include the brushing of Aphids from the plants by means of aphidozers, but these machines can only be used without injury to the plants early in the season when they are small and the Aphid colonies are mostly on the tips and small upper leaves. For

general purposes a dust containing 3 per cent. nicotine with hydrated lime as the carrier has proved satisfactory, though other carriers, such as sulphur or gypsum, have given good results. More than one application is often needed to obtain good control, and this dust is expensive for use over large areas where peas are grown for the cannery. Peas and clover should not be grown in neighbouring fields. Clover grown for green manure and found to be infested in the spring may be ploughed under before the Aphids migrate to the peas. The practice of burning over fields containing clover in the early spring and autumn would ensure the destruction of the Aphids or their eggs. The most important precautionary measure in Maine is probably early planting with a good proportion of early pea seed, so that the plants may have passed the most susceptible stage of their development before the migration of the Aphids from their winter food-plant.

GAHAN (A. B.). U.S. Bur. Ent. **Miscellaneous Descriptions of New Parasitic Hymenoptera with some Synonymical Notes.**—*Proc. U. S. Nat. Mus.*, lxxi, art. 4, no. 2676, 39 pp., 1 pl., 3 figs., 8 refs. Washington, D.C., 1927.

The parasites dealt with include: the Braconids, *Opius fulvicollis*, Thoms. (*cupidus*, Gah.), bred from *Pegomyia hyoscyami*, Panz., in Pomerania and New York, and *Diospilus curticaudis*, sp. n., from larvae of *Haltica litigata*, Fall., in Louisiana; the Pteromalids, *Merisus harmolitae*, sp. n., from *Harmolita grandis*, Riley, in California, and *Cecidostiba acuta*, Prov. (*ashmeadi*, Crawf.), from *Polygraphus rufipennis*, Kby., in New Brunswick and West Virginia; the Eupelmids, *Encyrtaspis semirufus*, sp. n., from *Cydia (Laspeyresia) molesta*, Busck, in Georgia, and from unknown hosts in Texas and Louisiana, and *Anastatoidea brachartoniae*, gen. et sp. n., from *Artona (Brachartona) catoxantha*, Hmps., and from *Degeeria albiceps*, Macq., *Ptychomyia remota*, Aldr., *Apanteles* sp., and an Ichneumonid, all parasitic on *A. catoxantha*, in Java, keys being given to the species of *Encyrtaspis* and *Anastatoidea*, the latter including, in addition to the type species, three Queensland species transferred from *Metapelma*; the Encyrtids, *Ooencyrtus (Encyrtus) submetallicus*, How., from eggs of *Nezara viridula*, L., in St. Vincent, *Coccidencyrtus ochraceipes*, sp. n., from *Diaspis boisduvali*, Sign., in a greenhouse in New York, and *Aphidencyrtus (Encyrtus) inquisitor*, How. (*schizoneuræ*, Ashm., *aphidiphagus*, Ashm., *websteri*, How.); the Eulophids, *Encarsia meritoria*, sp. n., from *Trialeurodes floridensis*, Quaint., in Florida, *E. basicincta*, sp. n., from *Aleurothrixus floccosus*, Mask., in Porto Rico, *Prospaltella bella*, sp. n., from *Chionaspis pinifoliae*, Fitch, in Michigan [*R. A. E.*, A, xiv, 167], *P. ciliata*, sp. n., from *Aleurodicus* sp., in Porto Rico, *Coccophagus gossypariae*, sp. n. [*R. A. E.*, A, xii, 445], from *Gossyparia spuria*, Mod., in New York and Massachusetts, *C. lecanii*, Fitch (*coccidis*, Gir., *cowperi*, Gir.), from *Coccus hesperidum*, L., in Louisiana, *Saissetia oleae*, Bern., in South Africa and *Stictococcus gowdeyi*, Newst., in Uganda, *Pleurotropis tarsalis*, Ashm. (*ashmeadi*, Crawf.), from *Apanteles melanoscelus*, Ratz., in New Hampshire, *Dasyscapus parvipennis*, gen. et sp. n., from *Thrips tabaci*, Lind., of which it is thought to be a hyperparasite, in Java [*R. A. E.*, A, xii, 67], and *Physcus (Encarsia) diaspidis*, How.; the Mymarid, *Anaphoidea calendrae*, sp. n., from the eggs of *Sphenophorus (Calendra) minimus*, Hart, S. (C.) *destructor*, Chitt., S. (C.) *callosus*, Ol., S. (C.) *costipennis*, Horn, S. (C.) *parvulus*, Gyll., S. (C.) *perlinax*, Ol.,

and *S. (C.) maidis*, Chitt., in Missouri; the Scelionid, *Hadronotus atriscapus*, sp. n., from eggs of *Narnia pallidicornis*, Stål, and *N. femorata*, Stål, in Texas; and the Platygasterid, *Amitus aleurodinis*, Hald. (*Anaphes mellicornis*, Ashm.), from various Aleurodids in the United States and Mexico.

ATWELL (H. C.) & STEARNS (H. C.). **Report of Work done, Seasons 1925 and 1926, at the Portland Insectaries with Parasites of the European Earwigs, *Digonochaeta setipennis* and *Rhacodineura antiqua*.**—23 pp., typescript. Portland, Oregon, 1st November 1926. [Recd. May 1927.]

The introduction from Europe and methods of rearing and colonisation of the Tachinids, *Digonochaeta setipennis* and *Rhacodineura antiqua*, as parasites of the European earwig, *Forficula auricularia*, are described. Under natural conditions in Oregon, *D. setipennis* passes the winter in the puparium, emerges during April, May and June, and deposits living larvae about 12 to 15 days after pairing. These larvae enter the bodies of earwigs and mature in from 24 to 30 days, without causing any external distortion of the host; they then emerge for pupation and become adult within two weeks. The second generation larvae probably mature in late autumn and pass the winter as puparia. Larvae entering their hosts in late May and June may not become mature until August, September or October, in which case they emerge and pass the winter as puparia.

In breeding this fly, precautions were taken to exclude *Dibrachys cavus* (*boucheanus*), a Chalcid that has been observed to emerge from its puparia in Europe and is known to be present in Oregon. The authors incline to the view, however, that this Chalcid is actually a hyperparasite of the Tachinid, attacking its Ichneumonid parasite, *Phygadeuon scaposus*, which does not occur in Oregon.

*Rhacodineura antiqua* in western Oregon passes the winter as a larva within the body of *F. auricularia* and emerges during the last half of May. Pupation follows immediately and lasts normally about 20 days, after which the adults emerge. They pair and feed for 10 to 15 days before beginning oviposition, for which they search out leaves and other food upon which earwigs have previously fed and deposit on them numerous minute black eggs. These are eaten by the earwig and hatch in the alimentary tract, the small larvae burrowing through to feed on the tissues of the host. Adults of this generation begin to emerge about the end of July and continue through August and perhaps into September. They deposit the eggs that give rise to the overwintering larvae. A large number of puparia of *D. setipennis* have been recovered in the field, and there is evidence that *R. antiqua* has already become established naturally near the insectary where it was bred.

DRAKE (C. J.) & DECKER (G. C.). **Some Caterpillars frequently mistaken for the European Corn Borer.**—*Iowa Agric. Expt. Sta.*, Circ. 103, 16 pp., 19 figs., 2 refs. Ames, Iowa, April 1927.

Short notes are given on the bionomics of *Pyrausta nubilalis*, Hb. (European corn borer) and other Lepidoptera, the larvae of which might be confused with it. Most of these have already been noticed in this connection; others dealt with are: cutworms (of which *Prodenia ornithogalli*, Guen., was common on maize in Iowa in 1926); *Cirphis*

*unipuncta*, Haw. (army worm); *Loxostege sticticalis*, L. (sugar-beet webworm); *Elasmopalpus lignosellus*, Zell. (lesser corn stalk borer); *Macronoctua onusta*, Grote (iris borer); and *Epiblema otiosana*, Clem. The last-named feeds on *Bidens* spp., in the stems of which the larvae hibernate, and has two generations a year, the moths appearing in late May or early June and in August. It is an alternative host of two native parasites of *P. nubilalis*, *Microbracon caulicola*, Gah., and *Epiurus pterophori*, Ashm., and three other parasites were reared from it. One of the introduced parasites of *P. nubilalis*, *Microbracon* (*Habrobracon*) *brevicornis*, Wesm., has also been reared on the larvae of this moth.

PARKER (H. L.) & THOMPSON (W. R.). U.S. Bur. Ent. **A Contribution to the Study of Hibernation in the Larva of the European Corn Borer** (*Pyrausta nubilalis*, Hüb.).—*Ann. Ent. Soc. Amer.*, xx, no. 1, pp. 10–22, 5 figs., 6 charts. Columbus, Ohio, March 1927.

It has been recognised for some time that the diapause exhibited by various insects at some stage of their development is very imperfectly understood, and recent studies have resulted in the formulation of various theories to account for it [*R.A.E.*, B, xi, 55; A, xv, 247, etc.]. In the course of dissections of many larvae of *Pyrausta nubilalis*, Hb. (European corn borer), it was discovered that as the spring advanced certain very definite changes occurred in the rudiments of the reproductive organs. In the female larvae these changes are difficult to follow owing to the minuteness of the ovarian rudiments, and it was therefore decided to undertake a series of observations on the development of the genital organs in the male larvae. The results are presented as a mere outline of a method by which the problem can be attacked.

The histological structure of the gonads in these larvae varies according to their age, and the resumption of activity by hibernating larvae is characterised by the swelling of the reproductive rudiments. The authors have defined four phases in development of the organs according to the measurements of the testicles. As their growth is gradual and continuous, the definitions given are necessarily somewhat indefinite, but it is believed that they will permit a classification of the larvae sufficiently accurate for the study of the life-history. In phase 1 the cytological condition of the gonads is very uniform, the ampullae containing only spermatogonia and spermatocytes of the first order; in phase 2 the condition of the gonads is somewhat more variable, but this phase is characterised by an increase in the size of the spermatocytes and by the appearance of division figures, which seem to be a definite indication that the larva has emerged from hibernation; in phase 3 the gonads are again variable, but characterised for the most part by the appearance of spermatocytes containing spermatozoa in process of development; in phase 4 the gonads contain little else but elongate spermatocytes filled with spermatozoa, most of which are completely formed, though a few ampullae in earlier stages are present here and there. The data obtained by these dissections are summarised in a table and preserved graphically in a series of charts. It is obvious from these that the study of the reproductive organs affords an easy method of ascertaining fairly accurately the stage of development of larvae, which it is impossible to classify by means of external characters. The examination of the gonads constitutes a practical method of determining the approximate moment of emergence from hibernation and

the progress of emergence in any given area. It is probable that when once the larvae have emerged their development is governed by such factors as temperature and humidity.

There are also indications that the study of the development of the larval gonads may throw some light on the problem of the causes of the hibernating condition. For example, some dissections of the summer generation of larvae showed that in the fourth instar the gonads were already in phase 2 and that in the fifth instar they developed very rapidly, while in fifth instar larvae examined even late in the summer in a one-generation area the gonads were all in phase 1. It is therefore concluded that the inhibition of development affecting the imaginal organs is determined by factors operating at a fairly early stage in the larval life, and is to a great extent, if not completely, independent of conditions prevailing in the height of the summer months. The larval organs continue to develop in the individuals predestined to hibernate until they are completely formed; the arrest of development affects only the imaginal rudiments, and the histolysis of the larval organs begins only after the histoblasts have resumed activity. This seems to indicate that the degeneration of the larval tissues preparatory to metamorphosis is in some way dependent upon the development of the imaginal tissues.

The difference in rapidity of development of the gonads in the larvae of hibernating and non-hibernating types makes it possible by dissection to define fairly accurately the character of the larval population in transitional areas. Some examples are given indicating that in a series of dissections of fifth instar larvae the percentage of individuals with gonads in phase 1 will probably approximate fairly closely to the percentage of hibernating larvae in that region, especially if the dissections are made during the height of the pupation period. It should be possible by appropriate dissections to estimate the character of many transitional areas from year to year, and thus gain an insight into the causes determining the variations in life-history in the different regions inhabited by the borer.

LARSON (A. O.). U.S. Bur. Ent. **The Host-selection Principle as applied to *Bruchus quadrimaculatus*, Fab.**—*Ann. Ent. Soc. Amer.*, xx, no. 1, pp. 37-79, 1 pl., 33 refs. Columbus, Ohio, March 1927.

The experiments described in this paper show that the principle of host-selection laid down by Hopkins, namely, that an insect "species which breeds in two or more hosts will prefer to continue to breed in the host to which it has become adapted," does not appear to hold good in the case of *Bruchus quadrimaculatus*, F. The small amount of work that has been previously published on this subject is briefly reviewed. There are numerous other insects of economic importance, the tendencies of which do not indicate the development of new species by way of host-selection, but rather point towards a wider range of material upon which to perpetuate the species. Among these are *Cydia* (*Carpocapsa*) *pomonella*, L. (codling moth) on walnut, apple and pear; *Mayetiola* (*Phytophaga*) *destructor*, Say (Hessian fly); *Calandra oryzae*, L. (rice weevil); and *Plodia interpunctella*, Hb. (Indian meal moth). An example of an insect of no apparent economic importance adapting itself voluntarily to new conditions and thus becoming a potential menace is *Bruchus pruininus*, Horn, which has been known for years to breed only in seeds of *Acacia*. Beans of different varieties

grown near infested *Acacia* were found when harvested to be infested with this insect, and it was bred in soy beans (*Glycine hispida*) in storage through four generations. In no case was the insect forced through lack of food or any other condition to oviposit on the cultivated plants.

The author has experimented for the past five years with *B. quadrimaculatus* in California and has found that this species, which normally breeds in cowpeas (*Vigna sinensis*), can breed in many varieties of leguminous seeds, oviposition occurring more frequently on well matured seeds of any variety than on unmatured or broken seeds of the same variety. Regarding the choice of seeds for oviposition, the author gives long lists of seeds from which he has been able to breed *B. quadrimaculatus* and of others from which he has not been able to breed it. He divides seeds into three groups, as being favourable, less favourable or not favourable for oviposition. In some media chosen for oviposition (soy beans for example) the larval stages show retarded development, apparently either through inability of the larvae to obtain sufficient food or through lack of some elements in that food. The adults show no marked predilection for the food in which they have bred, and continued breeding in any food does not appear to intensify a preference for that material. It was found that oviposition occurred freely even on some varieties in which there is a total mortality of the young larval stage, while in other varieties in which the larvae could not survive there was marked hesitancy over the deposition of eggs. Again, while the female oviposits freely on certain varieties that are favourable for all stages of development, it shows great reluctance to oviposit on others that seem to be equally favourable. This indicates that there is some factor rendering certain seeds preferable to others for oviposition purposes, and in fact there seems to be a predilection for seeds with smooth, well-filled coats; this is borne out in all the experiments described in this paper, and also by the fact that the beetle oviposits freely on painted lead pencils, varnished handles, door frames, etc., that are stained and varnished, but refuses to oviposit on rough or unpolished wood. Broken seeds of any kind are never used if sound ones are available. There is, however, some factor besides smoothness of the seed-coat that influences the choice, for the tepary bean (*Phaseolus acutifolius*) is avoided, although it would appear as favourable as many other varieties. The coat of this bean, however, begins to wrinkle as soon as it is moistened.

Any inherited tendency towards the formation of host strains or phytophagic species would have to be exhibited by the adult only, as the eggs are glued to the seed and the young have no means of gaining access if the egg is not firmly attached. It was observed in these experiments that *B. quadrimaculatus* seems incapable of breeding in any of twenty varieties of *Phaseolus vulgaris*.

COTTON (R. T.). U.S. Bur. Ent. **Notes on the Biology of the Meal Worms, *Tenebrio molitor*, Linné, and *T. obscurus*, Fab.**—*Ann. Ent. Soc. Amer.*, xx, no. 1, pp. 81–86, 6 refs. Columbus, Ohio, March 1927.

This paper records the results of three years' study of the meal-worms, *Tenebrio molitor*, L., and *T. obscurus*, F. The latter is occasionally injurious in all parts of the United States, but the former has not been recorded from the southern States. The adults of the two species resemble each other and both are nocturnal in habit. At Washington,

D.C., the adults begin to appear in spring, *T. obscurus* sometimes as much as a month in advance of *T. molitor*, the females of *T. obscurus* living for an average of 84 days and those of *T. molitor* for an average of 65 days. Pairing occurs a few days after emergence, and after a pre-oviposition period of 1 to 3 weeks oviposition begins, a female of *T. obscurus* depositing an average of 463 eggs, while the average for *T. molitor* is about 276. The rate and frequency of oviposition are variable, and data are recorded to illustrate this. The eggs are deposited singly or in small clusters, generally in the flour or meal in which the insect is breeding; they hatch in 4 to 19 days, according to the temperature. The larval stage varies considerably in length and is influenced by several factors, but both species normally require at least a year for their development under storehouse conditions, the winter being passed in the larval stage. In the case of *T. obscurus* a few larvae hatch early in the year and produce adults by midsummer, the majority transform at the end of the first year during the spring and early summer, and a few remain as larvae for two years. The shortest normal larval period recorded for *T. molitor* is 281 days, and the longest 629 days. Larvae reared in an incubator under favourable conditions of temperature, humidity and food completed the larval stage in six months, and both species continued to breed without interruption throughout the year, all stages being present at the same time. When full-grown, the larvae of both species come to the surface of the foodstuff in which they are living and pass through a short pre-pupal period. In the laboratory, larvae of *T. obscurus* began to pupate in November, but in unheated barns, etc., they do not pupate normally until spring or early summer. Pupae of *T. molitor* were obtained in the laboratory in late January, but normally in storehouses they are not found before May or June. The length of the pupal stage is dependent chiefly on prevailing temperature conditions and was observed to last from 7 to 20 days in the case of *T. obscurus* and from 6 to 18 days in the case of *T. molitor*.

ZELLER (S. M.). **Preliminary Studies on Witches' Broom of Strawberry.**—*Phytopathology*, xvii, no. 5, pp. 329–335, 4 figs., 1 ref. Lancaster, Pa., May 1927.

Preliminary experiments in Oregon in 1926 showed that witches' broom of strawberry is a virus disease, that may be transmitted by the Aphid, *Myzus fragae-folii*, Ckll., which was the only insect on which observations were made. Aphids from healthy strawberry plants did not produce the disease; but 14 out of 21 plants showed symptoms of witches' broom in 3–4 weeks after Aphids that had fed on diseased plants for 8 days were transferred to them. During a period of six months the symptoms became more and more apparent.

DRAKE (C. J.) & HARRIS (H. M.). **The Control of Armyworms and Cutworms.**—*Iowa Agric. Expt. Sta.*, Circ. 101, 8 pp., 6 figs. Ames, Iowa, March 1927.

The army worm, *Cirphis unipuncta*, Haw., and several species of cutworms are always present in the gardens and fields of Iowa, the former occurring generally in low-lying grassland, while the latter cut off young vegetable and garden plants and particularly attack young maize. In 1924 army worm outbreaks occurred in 35 counties and cutworms were abundant in 76 counties, causing the re-planting of more

than 12,000 acres of maize, much of which was again destroyed. Over 100,000 acres of maize, oats, barley and pasture were badly injured. Cutworm injury has increased in intensity and extent during 1925 and 1926. The life-cycle and habits of both army worms and cutworms are described. The poison bait recommended for their control is 1 lb. Paris green (or sodium fluoride) or  $\frac{1}{4}$  U.S. pint sodium arsenate, 2 U.S. quarts cheap molasses and 20 to 25 lb. wheat bran to 2 U.S. gals. of water.

EDDY (C. O.) & McALISTER, JR. (L.C.). **The Mexican Bean Beetle.**—*S. Carolina Agric. Expt. Sta.*, Bull. 236, 38 pp., 17 figs., 11 refs. Clemson College, S.C., March 1927.

The distribution of *Epilachna corrupta*, Muls. (Mexican bean beetle) in the western part of South Carolina since its first appearance in 1921 is described, and the life-history, type of injury caused and food-plants are discussed. Some of the studies made in 1925–26 have already been noticed from a shorter and earlier report [*R.A.E.*, A, xiv, 286]. Oviposition records for 1926 are contrasted with those for 1925 and verify the general observations of delayed activity caused by a long cold spring and then decreased activity during extended drought and high temperatures, that is, during late July and early August, just when the first generation would be approaching maximum oviposition. Greater control of *E. corrupta* has been obtained by unfavourable weather conditions than by parasites or predators. Besides *Megilla fuscilabris*, Muls. [*loc. cit.*], natural enemies in South Carolina include *Hippodamia convergens*, Guér., and occasionally other Coccinellids, and a number of predacious Rhynchota, of which only *Podisus maculiventris*, Say, is of any importance. During extreme heat all immature stages and many adults of *E. corrupta* were found dead in the fields. On the whole it seems probable that the status of the Mexican bean beetle in South Carolina will be variable, depending on weather conditions; it will become a major pest in years of normal temperature and rainfall, decreasing in numbers in years of high temperature and drought. Total eradication is unlikely to occur.

During the past three seasons many insecticide experiments have been conducted, including a study of arsenicals adsorbed on various carriers [*R.A.E.*, A, xiv, 262]; in 1926 sodium arsenite with talc as a carrier gave the best results. The quantity of arsenic necessary may also be lessened by precipitating calcium arsenate in the presence of the same carriers, and the resulting material is more toxic than mixtures of arsenicals and hydrated lime containing about an equal amount of arsenic. Experiments with fluosilicates have confirmed the findings of previous investigators [*R.A.E.*, A, xiv, 254, 272, etc.]. In low concentration in spray solution the toxicity of sodium fluosilicate was high and compared favourably with that of the arsenical poisons, but the toxicity of barium fluosilicate in sprays was lower than that of the arsenicals, while that of calcium fluosilicate compound was lower still. The sodium and barium fluosilicates produced the highest toxicity in *E. corrupta* when used as dusts; calcium fluosilicate compound was less toxic but gave good results when used undiluted. Barium fluosilicate did not scorch either bean or cotton plants, even when undiluted; sodium fluosilicate scorched slightly when undiluted in dry weather or in small dilutions in humid weather; calcium fluosilicate has never produced any injury. All fluosilicate mixtures were made just

prior to dusting. Calcium arsenate has proved to be one of the best and cheapest insecticides, and when properly mixed with hydrated lime in either dust or spray mixture, produces no scorching. Magnesium arsenate, although very expensive, caused less scorching to bean plants when diluted with 4 parts hydrated lime than any other material. It was as toxic as any mixture tried but has not such good physical properties for dusting as calcium arsenate. Lead arsenate gave good control under all conditions and could be used without evident injury during midsummer, though in spring and autumn any dilutions that were effective caused scorching. This material is more expensive than calcium arsenate. Zinc arsenite was unsafe for use on bean foliage except when greatly diluted, and was then not very effective in control; it is expensive and difficult to purchase. London purple was very effective, but scorched bean plants more readily than did calcium arsenate. The dust mixture of calcium arsenate, lime and sulphur recommended in Alabama [R.A.E., A, xii, 165] gave satisfactory control, but cost rather more than calcium arsenate with lime. It is obvious from the results obtained that the amount of foliage injury by insecticides is largely influenced by climatic conditions, and the indications are that more dilute poisons must be used during seasons of high humidity. Instructions for making dust mixtures are given, with suggestions regarding the time and method of application. Measures for preventing infestation include cleaning up the hibernation quarters, disposing of bean crops destroyed by the pest, choosing varieties that do not produce heavy, bushy foliage, and so are easily dusted or sprayed, and ensuring that bean foliage shall not be available during some part of the hot, dry summer.

Other important bean pests occurring in South Carolina during these investigations were the leafhopper, *Empoasca fabae*, Harr. (*mali*, Le B.), which was present in great numbers for 6 or 8 weeks, but was controlled by Bordeaux mixture; *Cerotoma trifurcata*, Forst. (bean leaf beetle), which can be controlled by the poisons used for *E. corrupta*; *Heliothis obsoleta*, F., the larvae of which burrowed through the centre of bean pods; and nymphs and adults of *Psallus seriatus*, Reut. (cotton flea-hopper), which were present on growing bean plants throughout the season of 1926.

WALLACE (F. N.) & others. **Report of the Division of Entomology.**—*8th Ann. Rept. Dept. Conservation Indiana, 1925-26*, pp. 32-62. Indianapolis, Ind., 1927.

The insect pests that have occurred in Indiana in addition to those already noticed from recent reports [R.A.E., A, xi, 309; xii, 345; xiii, 262; xv, 186] include *Aspidiotus abietis*, Schr. (fir scale), found for the first time on nursery stock, several hundred *Abies concolor* from an adjacent State being heavily infested; *Chionaspis americana*, Johns. (American elm scale), a rather common pest of elms in nurseries, where it does little damage, though it may increase rapidly enough to check the growth of the trees when replanted; *C. corni*, Cooley (dogwood scurfy scale), recorded for the first time in Indiana nurseries, from the native pale dogwood (*Cornus obliqua*) used for ornamental planting; *C. furfura*, Fitch (apple scurfy scale), the scale most commonly found on apple and pear stock, and in apple orchards; *Cryptorhynchus lapathi*, L. (poplar and willow borer), a serious nursery pest on all ornamental poplars and willows; *Melalopha inclusa*,<sup>1</sup> Hb.

(poplar tent maker), noticed abundantly in Indiana for the first time ; *Capitophorus* (*Myzus*) *ribis*, L. (currant aphid), which was less serious than in the previous year ; and *Scolytus rugulosus*, Ratz. (fruit-tree bark-beetle), which killed cherry trees injured by winter conditions.

*Gossyparia spuria*, Mod. (European elm scale), was apparently eradicated from the one nursery that was infested, by a heavy oil spray applied both in the late autumn and early spring before growth started. Adults of *Alabama argillacea*, Hb. (cotton worm), appeared in swarms on 7th and 17th September and 9th October, borne on the upper air currents of the prevailing winds from the cotton-growing districts of the south. These moths are able to pierce the skin of ripe fruit and suck out the juices, late peaches, autumn apples, grapes and tomatoes being considerably damaged in the southern half of the State ; they do not, however, survive the winter. *Pulvinaria vitis*, L. (cottony maple scale), was probably the most important pest of shade trees during the year. The eggs begin to hatch towards the middle of June, and the larvae crawl upwards and settle on the lower surface of the leaves within 48 hours of hatching. With the approach of cold weather, the half-grown scales migrate to the under side of the branches. The winged males appear about the middle of August. The females continue their growth in the spring and mature towards the end of May, when the formation of the egg-mass takes place. Oil sprays are superior to lime-sulphur, and should be applied just before the leaves come out ; each insect must be covered with the spray. Later on a severe infestation may be prevented by washing the egg-masses from the lower surface of the branches with a hose, provided there is sufficient pressure at the nozzle to break the egg-mass. There are two common natural enemies of this scale in Indiana, the predacious Coccinellid, *Hyperaspis binotata*, Say, and the Chalcid, *Coccophagus lecanii*, Fitch. The former oviposits in the egg-masses of the scale, and the larvae eat the eggs and the young scales. The adults also prey on the young scales. Usually these natural enemies will control the scale in a year or two.

Of the trees attacked by *Thyridopteryx ephemeraeformis*, Haw. (bagworm moth), evergreens suffered most, one complete defoliation of these trees causing their death. The cocoons should be cut off in the winter and burned, as the tough silk by which they are secured to the twigs holds firmly for several years and may girdle them. A spray of 1 oz. lead arsenate and 1 oz. soap to 1 U.S. gal. water may be applied when the caterpillars are feeding. The soap should be omitted when spraying evergreens, since it causes the spray to remain too long on the trees, giving them a white-washed appearance.

In certain localities serious defoliation by *Hemerocampa leucostigma* S. & A. (tussock moth) has been noticed. The best control method is the burning of overwintering egg-masses, or the spraying of infested trees with the lead arsenate spray mentioned above. Heavy infestations of *Longistigma carvae*, Harris (sycamore aphid) were reported on sycamore and willow, although no serious damage was done.

*Pyrausta nubilalis*, Hb. (European corn borer) has made its appearance in six counties in Indiana. The damage by *Cirphis unipuncta*, Haw. (army worm) over the State as a whole was small, perhaps the greatest being to timothy grass [*Phleum pratense*]. In cases where the infested hay was cut the caterpillars migrated to maize, which was severely damaged. The caterpillars were heavily parasitised by *Winthemia quadripustulata*, F., and a species of *Apanteles*, and where the timothy

was left uncut, no damage was done to maize in the vicinity and no second brood developed, apparently owing to the presence of these parasites.

Vegetable pests included *Epitrix cucumeris*, Harr., on potatoes and tomatoes; *Pieris rapae*, L., on cabbage, and *Aphis* (*Rhopalosiphum*) *pseudobrassicae*, Davis, on radish, horseradish, cabbage and turnips. *Epilachna corrupta*, Muls. (Mexican bean beetle) did considerable damage in the southern part of the State to field and garden beans. It has continued to spread northward, and studies on its distribution show that it is likely to be most injurious in hilly regions where there is sufficient woodland to protect the overwintering adults, which congregate in large numbers under the leaves.

*Phlyctaenia rubigalis*, Gn. (*ferrugalis*, auct.) (greenhouse leaf-tyer) was the most common greenhouse pest; in some cases severe defoliation of chrysanthemums occurred, but taken as a whole the damage caused throughout the State was small. A list is given of some of the common greenhouse plants that are attacked and on which infestations are carried over from one season to the next. Little trouble was experienced in controlling this pest where the undersides of the leaves of plants were kept covered with a coating of lead arsenate; lights placed over shallow pans of oil, as traps for the adults, are also of value, particularly if used in conjunction with a slight fumigation with nicotine, the fumes of which irritate the moths so that they all take flight and are more easily attracted to the lights.

Details are also given of a number of insect pests attacking various flowers and ornamental plants.

EDDY (C. O.). **The Cotton Flea Hopper.**—S. Carolina Agric. Expt. Sta., Bull. 235, 21 pp., 11 figs., 5 refs. Clemson College, S.C., March 1927.

A good deal of the data concerning *Psallus seriatus*, Reut. (cotton flea-hopper) obtained in other parts of the United States [R.A.E., A, xiv, 275, 629-632, etc.] is applicable to conditions in South Carolina, where the insect has been recognised as a pest since 1924. Early injury to seedling cotton is shown by stunting or retarding of the growth, shortening of the internodes, blasting of the buds, development of an excessive number of branches very near together and the formation of irregularly shaped leaves with marginal erosions and some holes. That this injury was all due to *P. seriatus* was proved by a number of cage experiments, which are described. The injury to older cotton plants caused the shedding of large numbers of squares, excessive growth of the main stem and a suppression of the fruiting branches. Much of the early crop and varying amounts of the middle crop were a total loss on this account in 1926. The cotton that matured came chiefly from squares that formed after the rains began and after the numbers of the Capsid had decreased (during late July and early August). Important alternate food-plants in South Carolina are *Croton glandulosus*, which provided food throughout the season, and *Oenothera biennis* and *O. lacinata* (species of evening primrose), which died out in late July. Snap beans have occasionally served as food-plants for all stages, and potato plants and late flowers may serve for the adults. Eggs were found only on croton and cotton late in the autumn after growth had ceased. The suggested remedies are clean cultivation and keeping terraces free from weeds, particularly croton and evening primrose.

All croton should be pulled up very early in autumn so that all eggs on it have time to hatch before the cold weather arrives. Croton and cotton not destroyed in autumn should be ploughed under in winter or very early in the following spring, care being taken to cover the tops and ends of the branches, as the majority of eggs are on these parts. Dusting with sulphur should be done as soon as the hoppers are numerous and many squares appear to be blasted, and should be repeated in about four or six days, using from 10 to 15 lb. of dusting sulphur to an acre. Early-formed squares especially need protection.

COCKERELL (T. D. A.). **The Cost of Oranges.**—*Sci. American*, cxxxvi, pp. 375–377, 9 figs. New York, N.Y., June 1927.

This is a popular account of the pests of *Citrus* in California and of the work that has been done on their biological control, together with a very brief note on fumigation methods. In two counties alone nearly £400,000 was spent on the control of *Citrus* pests in 1925.

SWENK (M. H.). **The Pine Tipmoth in the Nebraska National Forest.**—*Nebraska Agric. Expt. Sta.*, Res. Bull. 40, 50 pp., 9 figs., 25 refs. Lincoln, Neb., April 1927.

*Rhyacionia buoliana*, Schiff. (pine shoot moth), which has become fairly generally distributed throughout the United States since its introduction in 1876, was first observed in the Nebraska National Forest in 1909 and has seriously retarded the attempted afforestation of the Nebraska sandhills. The attack is chiefly made on young and growing pines, the favourite species being the jack pine (*Pinus banksiana*), though the Scots pine (*P. sylvestris*), the western yellow pine (*P. ponderosa scopulorum*), and probably species of *Picea* are also attacked. There are two complete but overlapping generations of *R. buoliana* annually in the Nebraska Forest. The winter is probably passed in the silken cocoons from which the moths emerge in May and deposit eggs singly or in very small groups on the outside of the leaf-bud scales. The larvae hatch in about 6 days and usually enter the base of an adjacent needle or needle cluster, in which they feed and burrow for a time before moving to the terminal bud of the shoot. On reaching the terminal bud the larva constructs a small, transparent, resinous cell, usually on the outside of the tip, within which it feeds for a time before beginning its longitudinal burrow. When the whole interior of the terminal bud has been consumed, the larva starts to burrow downward in the shoot, generally killing it as far back from the tip as the burrow extends. In some cases where the burrow is located entirely on one side of the shoot the uninjured side continues to grow, with the result that the tip bends to one side in a characteristic manner. Another feature significant of attack on the tips is the fact that new tips frequently form from buds just below the injured tip, so that the tree assumes a bunchy, asymmetrical appearance at the top. The larval development of this generation extends from about late May to late July, with some seasonal variation, pupation occurring in the larval burrow in the pine shoots. Pupae have been found from early June to late July, the pupal period lasting 9–13 days, and the moths being on the wing from late June to late July. Oviposition begins a few hours after emergence, the eggs being deposited chiefly on the contiguous surfaces of two pine needles and also elsewhere on the needles and their

sheaths. After an incubation period of 6 to 9 days the larvae hatch and burrow in the tips from early July to early September, though most of the larvae have matured and left their burrows by mid-August. A very few pupate in the larval burrow, but the majority drop to the ground and construct silken cocoons, where they probably pass the winter.

The ideal method of clearing up infestation would be the pruning and destruction of all infested tips, but as the moths are strong fliers, this would be useless unless it were done simultaneously over entire plantations, for re-infestation would quickly take place. Parasites reared from infested material from 1909 to 1912 were a Tachinid, a Braconid of the genus *Microbracon*, two Ichneumonids, one of which was identified as *Pimpla (Itoplectis) conquisitor*, Say, three Pteromalids, and three Chalcids, namely *Eurytoma* sp., which was by far the most numerous, continuing active until the early autumn, *Haltichella xanticles*, Wlk., and an unidentified species. This last was the only egg-parasite observed; it develops in about 8 to 11 days, and in a few instances two or even three parasites emerged from a single host-egg.

MACALONEY (H. J.). **The White Pine Weevil Problem in the New England States.**—*Pprs. Forest Prot. Conf., N. Y. St. Coll. Forestry, Nov. 10-12, 1926*, pp. 31-43, 4 figs. Syracuse, N.Y. [1927.]

This paper gives a description and life-history of the white pine weevil [*Pissodes strobi*, Peck], the most serious pest attacking white pine [*Pinus strobus*] in the United States. Its range is almost identical with that of the white pine itself, but it is chiefly important in the north-eastern and Lake States. Much of the information given in regard to its bionomics is similar to that already noticed [*R.A.E.*, A, vi, 62; ix, 359; xiv, 581]. One female may deposit from 50 to 150 eggs, probably in several leading shoots, the number of eggs found in a single shoot varying from 20 to 350, about 75 per cent. of the punctures, which average 170 to a shoot, containing eggs. The eggs are laid from the beginning of May till the end of July and hatch in from 6 to 14 days. Oviposition reaches its maximum in about three weeks and then gradually falls off.

The growth of the trees is stunted by the feeding of the larvae on the tender bark and between the bark and the wood. In any season all gradations between no height growth and practically all of it may be found, an attack by a large number of larvae early in the season resulting in the destruction of the living tissue, while a later attack may only affect leading shoots that have almost completed their year's growth. The larvae eat their way down the stem in dense formation, as many as 150 being packed closely in a section two inches long, and as they attain full size, bore into the pith and pupate, though owing to natural enemies, insufficient food and smothering by resin the number that finally emerges represents only a small proportion of the eggs laid.

Experiments made by means of adhesive bands attached to the bases and in some cases to the leading shoots of the trees, before the weevils had come out from hibernation, showed that they may approach the leading shoots by crawling up the stem from the ground, by flying to another part of the tree and crawling up the rest of the way or by flying directly to the leading shoot itself. Infestation increased

materially in the untreated plots as compared with the previous year, and decreased considerably in the banded plots, particularly where the leading shoots had been banded.

Beginning at a minimum height of 2 to 3 ft., when the trees are five or six years old, the rate of infestation on widely-spaced pure stands becomes increasingly greater, reaching a maximum at about 17 ft., from which point it decreases, becoming practically negligible at a height of 60 ft., though it has occasionally been found at 88 ft. The kind of soil and the direction of exposure are important factors. The highest rate of infestation is found on sandy and sandy-loam soil and with exposures to the east and south getting the morning sun, and the weevils will fly over a west or north slope to reach the trees at the top, going towards the sun. The steeper the slope the less the damage done.

The author believes that the most advantageous way to grow white pine in order to protect it from the weevil is to plant it in mixtures with hemlock [*Tsuga*] or the better hardwoods, subject to subsequent thinnings to prevent the pines from being crowded out. In pure stands the greater the number of trees to the acre the less the injury. The percentage of damage in plots containing 1,200 trees to the acre was 54, while at a density of over 1,750 the percentage was 11.1 and over 2,750, 8. In widely spaced stands it is advisable to remove infested leading shoots from the time the stand is liable to infestation until they are too high to be reached by hand. The cost should not be excessive if the work is done regularly from the time that the weevils first appear. Burning the shoots removed is the only certain way of destroying the larvae, but if they are left in the plantations till the spring in receptacles covered with a 12 to 14 mesh wire screen the parasites will be able to escape while the weevils will not. Recovery of the trees may be stimulated by the removal of bud clusters from all the laterals but one, which, by diverting all the available plant-food to the remaining lateral, will prevent an excessive amount of crook without impairing growth efficiency by reducing the leaf surface as would be the case if the laterals were removed entirely.

In the case of ornamental trees adults may be collected from the shoots during the feeding period, but this method is too costly for large areas. A 50 per cent. reduction of a slight infestation was secured with lime-sulphur, 10 oz. to 2 U.S. gals. water, and lead arsenate, 2 oz. to 2 U.S. gals. water, the cost of spraying being about 7s. and 6s. an acre respectively, chiefly for labour. The rate of infestation can be materially reduced by the use of adhesive bands, though this method is also too expensive to be used on a large scale. Of four or five promising insect enemies the most important are *Eurytoma pissodis*, Gir., and *Lonchaea laticornis*, Mg., which are external feeders. In one plantation 30 per cent. of the damaged shoots were stripped by birds and the larvae eaten.

MCINTYRE (H. L.). **Gipsy Moth Control.**—*Pprs. Forest Prot. Conf., N. Y. St. Coll. Forestry, Nov. 10-12, 1926*, p. 44. Syracuse, N.Y. [1927.]

A campaign was inaugurated in 1923 in New York State against the gipsy moth [*Porthetria dispar*, L.], which for seventeen years has been spreading westward at the rate of six miles a year and crossed the eastern border of the State in 1922. Though the measures taken have

been quite successful, the vigorous exclusion programme must be maintained in view of the extensive depredations of the moth reported in New England and the large colonies found in the Connecticut Valley.

APOLINAR MARIA (H.). **Insectos nocivos en los pastos de la sabana de Bogotá.** [Insects injurious in the Pastures of the Savannah of Bogotá.]—*Rev. Industrias*, iii, no. 35, pp. 413-415. Bogotá, April 1927.

The chief pests of pastures in the high plateau of Bogotá, Colombia, include the Melolonthids, *Clavipalpus ursinus*, Blanch., and *Manopus biguttatus*, Casteln., and the Dynastids, *Cyclocephala ustulata*, Burm., *C. scarabaeoides*, Burm., and *Heterogomphus dilaticollis*, Burm. The life-cycle of *C. ursinus* lasts about a year. The adults appear from April to June and are on the wing at twilight or in cloudy weather. The larvae of all these beetles feed on the grass-roots and may be killed by the fumes of paraffin from soaked rags buried in trenches, by injections of carbon bisulphide into the soil, or by watering the ground with a solution containing quicklime 60 lb., soot 60 lb., sodium hydrochlorate 10 lb., flowers of sulphur 5 lb., aloes 5 lb., some absinthe leaves, and water 100 gals.

DA MATTA (A.). **Larvas de lepidopteros e fungo prejudiciaes ao ananaz, manacá, milho e á figueira.** [Lepidopterous Larvae and a Fungus harmful to Pineapple, Manaca, Maize and Fig.]—*Sciencia medica*, v, no. 4, pp. 175-179, 3 pls. Rio de Janeiro, 30th April 1927.

The caterpillars recorded from bananas as *Castnia licus*, Dru. [cf. *R.A.E.*, A, ix, 445] are now stated to belong to another species, not identified. *C. icarus*, Cr., is very injurious to pineapple in Manaos. The caterpillars of the Danaid, *Aprotopos psidii*, L., feed on the leaves, shoots and tender twigs of manaca, *Brunfelsia* (*Franciscea*) *hopeana*, and those of the Syntomid, *Delphyre* (*Eucereum*) *rufiventris*, Schaus, cause considerable injury to the foliage of fig, *Ficus carica*.

BRÈTHES (J.). **La lucha biológica contra el bicho de cesto** (*Oeceticus kirbyi* var. *platensis*). [Biological Measures against the Bagworm, *O. kirbyi* var. *platensis*.]—*An. Soc. cient. argent.*, cii, no. 1-3, pp. 6-38. Buenos Aires, July-September 1926. [Recd. June 1927.]

The success achieved by the Tachinid parasite, *Parexorista caridei*, Brèthes, in controlling the bagworm, *Oeceticus kirbyi* var. *platensis*, in Argentina [cf. *R.A.E.*, A, x, 340] is confirmed by reports from numerous localities. *Tetrastichus platensis*, Brèthes, is the only other parasite of economic importance.

DOZIER (H. L.). **An Outbreak of the Red-striped Sugar-cane Scale.**—*Jl. Dept. Agric. Porto Rico*, ix, no. 4, pp. 357-367, 4 figs. Rio Piedras, P.R., October 1925. [Recd. April 1927.]

A short account of this outbreak of *Pulvinaria iceryi*, Guér., on sugar-cane in Porto Rico has already been noticed [*R.A.E.*, A, xv, 153]. A brief description of the various stages of the scale and its life-history is given. The parasites mentioned have now been identified as *Aphycus flavus*, How., *Cheiloneurus pulvinariae*, sp. n., which is a hyperparasite,

attacking *A. flavus*, and *Aneristus ceroplastae*, How., which is a true parasite, not a hyperparasite as was previously supposed [*loc. cit.*]. Both sexes of all three species are described, and lists are given of the Coccids from which *Aphycus flavus* and *Aneristus ceroplastae* have been recorded. The author has bred *A. ceroplastae* from *Coccus hesperidum*, L., in Louisiana and from *Ceroplastes cirripediformis*, Comst., *Saissetia hemisphaerica*, Targ., and *Eucalymnatus tessellatus*, Sign., in Porto Rico.

Box (H. E.). **Porto Rican Cane-grubs and their Natural Enemies, with Suggestions for the Control of Lamellicorn Larvae by means of Wasp Parasites (Scoliidae).**—*Jl. Dept. Agric. Porto Rico*, ix, no. 4, pp., 291–356, 2 pls., 19 figs., 16 refs. Rio Piedras, P.R., October 1925. [Recd. April 1927.]

The Lamellicorn larvae that attack sugar-cane in Porto Rico are the Melolonthids (brown hardbacks), *Lachnosterna portoricensis*, Smyth, *L. vandinei*, Smyth, *L. guanicana*, Smyth, and *L. (Phytalus) apicalis*, Blanch. (*insularis*, Smyth); and the Dynastids (black hardbacks), *Strategus titanus*, F., and *Ligyris tumulosus*, Burm. The interrelations between food-plants, pests, parasites and hyperparasites are discussed, and formulae are given for computing the progeny of insects where such progeny is represented by average figures, or is constant for each female parent. An account is given of the life-history and habits of Lamellicorns in general and the bionomics, seasonal history, distribution, and parasites of the particular species [*R.A.E.*, A, v, 410, 558; ix, 573].

The natural enemies of *L. portoricensis*, of which birds, lizards and carnivorous beetles are the most useful, also include *Sarcophaga robusta*, Ald., and the Tachinids, *Cryptomeigenia aurifacies*, Walt., and *Eutrixoides jonesi*, Walt. Hitherto no Scoliid parasites of the larvae have been known to occur in Porto Rico, but the author has shown that they are the host of *Campsomoris (Dielis) trifasciata*, F., and are also liable to attack by *C. (D.) dorsata*, F., and *C. (D.) tricincta*, F. (*pyrura*, Roh.). *L. vandinei* does similar damage in the west to that caused by *L. portoricensis* in the east. Nothing has been recorded as to its parasites and predators in Porto Rico, but the author believes them to be the same as those of the preceding species. The parasitic enemies of *L. guanicana*, which is probably attacked by the predators already mentioned, are unknown, but since it is almost identical in size with *Lachnosterna (Phytalus) smithi*, Arr., it seems probable that it could be controlled by the Scoliid, *Tiphia parallela*, Smith, which keeps *L. smithi* in check in Barbados. *L. (P.) apicalis*, Blanch., the smallest of the Porto Rican Melolonthids, is distributed all over Porto Rico, and although, owing to its size, it is not generally considered to be of great importance on cane, on the south coast at least it occurs in such numbers as to constitute a pest. The Scoliid parasite, *Elis haemorrhoidalis*, F., sometimes causes a 65 per cent. mortality in this species, but is itself attacked by the Bombyliid, *Anthrax gorgon*, F.

No insect parasites have been recorded from *Strategus titanus* in Porto Rico, but it has been found that the third instar larvae are readily parasitised by *C. (D.) atrata*, F., and the introduction of large numbers of this Scoliid from Santo Domingo is desirable. The larvae of *Ligyris*

*tumulosus* (rough black hardback) feed on humus in the soil, and although the more mature grubs consume decaying portions of old cane stools left in the banks between the rows of growing cane, damage to the crop is seldom correctly attributed to them. Under exceptional conditions, such as prolonged periods of drought, the larvae attack underground parts of growing cane owing to the absence of other moisture-bearing food, but this is so rare that no special measures of control are necessary. In Porto Rico and Barbados the third instar larvae are very heavily parasitised by *C. dorsata*, a Scoliid that also occurs in Brazil and the Guianas, where it attacks *L. ebenus*, Burm., and *L. gyas*, Er. This parasite is very abundant in Porto Rico and would probably exterminate *L. tumulosus* were it not itself heavily parasitised by certain flies, particularly the Bombyliid, *Anthrax lucifer*, F.

Two other Dynastids occur in Porto Rico, *Dyscinetus barbatus*, F., and *D. trachypygus*, Burm., but neither seems to be associated to any great extent with the sugar-cane crop, though the larvae of the latter have been recorded as damaging cane roots. They are mentioned, however, because other species of the same genus in British Guiana, *D. geminatus*, F., and *D. bidentatus*, Burm., act as hosts of *Tiphia parallela*, and these native Dynastids may be of use in establishing this parasite in Porto Rico.

The adult Melolonthids occur abundantly from April until mid-August, with the maximum numbers in June and July. A few may remain until as late as January. The first instar larvae occur in the field from mid-April until September, and the second instar from May until early October, while the destructive third instar grubs appear in August, reach their maximum numbers from November until February, and gradually disappear until in June and July very few can be found. They are, therefore, most abundant just when late *primavera* cane has reached its most critical stage of development. It is not yet known why the adults select certain fields for oviposition, but it seems probable that the chief factors concerned are the proximity of trees upon the foliage of which the adults feed, and the height of the cane, since they do not appear to deposit eggs to any great extent on cane more than 3 ft. high.

Experiments with paradichlorobenzene and calcium cyanide for the control of cane grubs showed that either of these substances is effective in killing up to 85 per cent. when applied at the rate of 1 oz. to a stool. The chemical was lightly scattered over the soil for a radius of 9 ins. from the centre of each stool, and the soil was slightly broken both before and after the application and then moistened with irrigation water. The results show the desirability of further trials, and some such method might prove economical in limited areas where large numbers of grubs occur. At present the only measure attempted is the collection of larvae and adults in the field, but the scale on which this is carried out is not satisfactory, and the expense incurred hardly appears justifiable.

A list is given of the predacious enemies and Dipterous parasites of the cane grubs, most of which have already been recorded [*R.A.E.*, A, ii, 48; viii, 484; xii, 30]. The most important enemies of the Lamellicornia in all parts of the world are the Scoliids, the general habits, bionomics and method of oviposition of which are described. The eggs of *Elis haemorrhoidalis* and *E. xanthonotus*, Roh., hatch within 32 hours of being laid, those of *C. dorsata* and *C. trifasciata* require 48 hours for development, and those of *C. atrata* 72 hours. The larval

stage of the two species of *Elis* lasts from 3-4 days, that of the two smaller species of *Campsomeris* 7 days, and that of *C. atrata* 14 days. The pupal period varies from 4 to 6 weeks, depending upon the prevailing temperature.

Little is known of the natural enemies of these Scoliids in Porto Rico except for the Bombyliids already mentioned. The author has bred a Tachinid from the cocoons of a Scoliid, probably *Tiphia parallela*, in British Guiana, and an unidentified Dipterous parasite of *C. dorsata* has been recorded in Porto Rico.

The importance of providing a constant succession of nectar-bearing flowers in the vicinity of cane-fields to encourage the presence of the anthophilous Scoliids is discussed, and a list of the Porto Rican plants that are attractive to these parasites is given, *Commicarpus scandens* and *Kallstroemia maxima* being the most important in the south of the Island. Certain Scoliids feed on the honey-dew secretions of Aphids and Coccids, and since it would not be advisable to encourage these insects, the author suggests that certain species of *Cordia* yielding a sweet secretion attractive to fossorial Hymenoptera should be imported into Porto Rico, since the native species do not apparently possess this property.

The method of rearing Scoliid parasites is described. Descriptions of *E. haemorrhoidalis*, *E. ephippium*, F., *C. atrata*, *C. dorsata*, *C. tricineta* and *C. trifasciata* are given, with notes on their biology. Nothing is known of the hosts of *E. ephippium* in Porto Rico, where it is apparently confined to the North Coast, but a closely allied species, *E. xanthonotus*, obtained by the author in Santo Domingo, was reared on larvae of *Lachnosterna portoricensis*, so that this Melolonthid is probably also the host of *E. ephippium*. The male of *E. xanthonotus* is quite different from that of the species known as *E. ephippium* in Porto Rico, but the females are very similar. *E. xanthonotus* has been considered to be a synonym of *E. ephippium*, and it is possible that this synonymy is correct, but in this case a new name will be needed for the species known as *ephippium* in Porto Rico.

Other Scoliids reported from Porto Rico, but unknown to the author, are *E. nitida*, Smith, *Tiphia argentipes*, Cress., *Campsomeris* (*Scolia*) *plumipes*, Drury, and *C. (Dielis) maculata*, Drury. Another species, possibly *Tiphia punctata*, Robt., has also been taken, feeding on the secretions of *Pulvinaria psidii*, Mask., on *Rauwolfia nitida* [R.A.E., A, xi, 60].

While attempts to introduce parasites from North America have failed [*loc. cit.*], the author considers it probable that their introduction from neighbouring West Indian Islands and from the mainland of South America, where climatic conditions are similar to those prevailing in Porto Rico, would be successful, and, for this reason, appends a list of Scoliids occurring in the West Indies and British Guiana.

He also suggests that further attempts should be made to introduce *T. parallela* against Porto Rican *Lachnosterna*, especially *L. guanicana* and *L. citri*, Smyth.

The Tachinid fly, *Ptilodexia harpasa*, Wlk., has been recorded from Haiti, parasitising the larvae of *Lachnosterna hogardi*, Blanch., a beetle closely related to *L. portoricensis* and *L. vandinei*, and the author is of the opinion that this is the most likely species of all foreign Diptera to become established in Porto Rico and recommends its introduction.

Box (H. E.). **Eleventh Report upon Entomological Work.**—24 pp., typescript. Central Aguirre, P.R., Central Aguirre Sugar Co., 9th April 1927.

This is an account of a visit to South America during January-April 1927, to make further importations of Braconid parasites of *Diatraea* and certain species of Scoliids known to attack Porto Rican cane grubs under laboratory conditions. In Venezuela cane is attacked by *Diatraea lineolata*, Wlk., *D. saccharalis*, F., and what is apparently an undescribed species, while larvae similar to those of *D. canella*, Hmps., were also found in two districts causing heavy local attacks. It is probable that the lighter infestation with *Diatraea* in Venezuela (where there are three or more species) compared with that of Porto Rico (where there is only one species, *D. saccharalis*) is due to the presence of numerous Braconid parasites of the larval stage, among which *Ipobracon grenadensis*, Ashm., is the most important. The species of *Diatraea* found in British Guiana have been dealt with elsewhere [R.A.E., A, xiv, 101]. The severity of the infestation appears to have increased since 1924, some fields showing as much as 95 per cent. of the cane bored, while the average infestation is probably even higher. On the one plantation visited in Dutch Guiana, where the cane is planted and covered up, the razor grass (*Paspalum virgatum*) has been eradicated over the whole 2,500 acres and the cane fields are less often burned before cutting [cf. loc. cit.], the infestation was decidedly less than in British Guiana.

*Diatraea saccharalis* alone occurs in Barbados, where it attacks cane of all ages and under all conditions and is a much more serious pest than in Porto Rico, primarily owing to the lack of any parasites of the larval stage. The cane fields in this island are not burned, conditions are ideal for the propagation of parasites, and if the amount of *Cordia* on the cane lands is increased, there seems to be no reason why the *Ipobracon* recently introduced should not breed under natural conditions and spread rapidly over the country. The eggs of the moth-borer are deposited at night and in seedling nurseries in Barbados where the young cane is grown in pots, a series of electric light bulbs has been suspended over trays containing water and oil, and it is claimed that since this method has been adopted the number of seedlings killed by *D. saccharalis* has been reduced by about one half, and that the system is more than paying its way. It is suggested that the British West Indies and British Guiana should co-operate with Porto Rico in the exchange of parasites, since they are in need of the Tachinid parasite of *Diatraea*, *Lixophaga* (*Euzenillioopsis*) *diatraeae*, Towns. [R.A.E., A, xiii, 86] and could in return supply Porto Rico with Braconid parasites of *Diatraea*, and *Tiphia* and other Scoliid parasites of *Lachnosterna*.

In Venezuela not less than 55 distinct species of Braconids, either belonging to the genus *Ipobracon* or closely related to it, occur on the leaves of maize, the most common being *I. grenadensis*, Ashm., which was known to parasitise the larvae of *Diatraea* in British Guiana, Trinidad and Grenada but had not apparently been recorded from Venezuela. Many of these have the habit of feeding on the sweet secretions of Homopterous insects (chiefly Aphids and leafhoppers) on the leaves of maize. *I. grenadensis* was noticed several times actually ovipositing in *Diatraea*. The extraordinary abundance and wide distribution of this species as compared with the other species of *Ipobracon* (which are apparently limited to a few square miles of country) seem to indicate that it is introduced and therefore partially

immune from the factors that prevent the increase of other species, more especially as the adults are decidedly smaller than those from British Guiana. Several species of *Microdus* were also collected but were not sufficiently numerous to enable shipments to be made to Porto Rico.

In British Guiana both sexes of *Ipobracon* were reported as very abundant upon *Cordia* and *Paspalum virgatum*, but toward the end of the same month the author was only able to collect comparatively few, nearly all occurring on *Cordia*. The sexes of *I. grenadensis* were about equal in number, but very few male *Microdus* were caught, practically 99 per cent. being females.

A striking feature of the south coast of Porto Rico is the almost complete absence of feeding grounds for the parasites of the *Ipobracon* type that are not anthophilous but feed on honey-dew secretions. This may also account for the relative scarcity of other Hymenoptera such as *Tiphia*. Here and there are guavas and other low bushes heavily infested with scale-insects that yield honey-dew, but the latter are gradually disappearing owing to the attacks of *Cryptolaemus montrouzieri*. Muls. It is therefore suggested that this deficiency should be remedied by the introduction of certain species of Boraginaceous plants of the genus *Cordia*, which have the peculiar property of secreting a sweet substance from glands situated on the lower surface of the leaves. In British Guiana these plants are abundant, *C. aubletii* being one of the commonest species. In Venezuela several species of *Cordia* were observed, the commonest being *C. cylindristachya* (which is also the predominant species in Barbados and Porto Rico). This species does not, however, yield a sweet secretion. In Barbados an imported species of *Cordia*, known as *C. interrupta*, attracts many insects, including beneficial parasites, and the author considers it probable that this species is identical with *C. aubletii* of British Guiana. Unfortunately few of these plants were found in the vicinity of cane-fields, so that the adults of *Tiphia* cannot obtain nourishment without leaving the locality where larvae of *Lachnosterna* occur. Provided other factors are favourable, no difficulty should be found in establishing *Ipobracon* in sugar-cane fields in Barbados, where small numbers were introduced by the author, and Porto Rico, if a suitable species of *Cordia* is present. Seeds of *C. interrupta* and *C. aubletii* have now been imported into Porto Rico (where no suitable species of *Cordia* at present occur) and are ready for distribution. The distribution of these plants should not only aid in the proper establishment of parasites recently introduced, but should provide extra feeding grounds of a more permanent nature for the indigenous Scoliids and Braconids as well as parasitic Diptera.

Notes are given on the distribution of the following species of Scoliids taken in Venezuela in 1926 and 1927: *Tiphia parallela*, Smith, one or more small species of *Tiphia* distinct from *T. parallela* and probably new, *Elis* (?) *pulchrina*, Cam., *E. caracasana*, Roh., *Campsomeris* (*Dielis*) *dorsata*, F., *C. (D.) wesmacli*, Lep., *C. (D.) hesterae*, Roh., *C. (D.) variegata*, F., *C. (D.) regina*, Sauss., and *C. (D.) hyalina*, Lep. *C. dorsata* was the only Scoliid found in British Guiana. In Barbados this species occurred abundantly and was observed feeding on the secretions of *Cordia interrupta*. Here and in Porto Rico its normal host is *Ligyris tumulosus*, Burm., though it occasionally attacks the Melolonthid, *Lachnosterna* (*Phytalus*) *smithi*, Arr., in Barbados and other species of *Lachnosterna* in Porto Rico.

Details are given of the arrangements made for shipping and receiving the consignments of parasites and of the numbers of adults and cocoons despatched from British Guiana and Venezuela.

COOK (H. H.). **Eelworm Disease of Chrysanthemums.**—*Gard. Chron.*, lxxxi, no. 2111, p. 415, 1 fig., 1 ref. London, 11th June 1927.

Nematodes, probably *Aphelenchus ritzemabosi*, were found in Berkshire in the leaves and roots of chrysanthemums and in the soil surrounding them. Since the eelworm moves upward from the soil on the outside of the stem on a thin film of moisture, finding entrance to the leaf through the stomata [*cf. R.A.E.*, A, ix, 426], all unnecessary spraying should be avoided. The soaking required by young plants must be followed by spraying with a fluid that will destroy the pest without killing the plants. A spray of  $\frac{1}{2}$  oz. nicotine to 1 gal. water, applied twice weekly for about three weeks, was found entirely effective. Cuttings should be taken from plants six inches or more in length, and the top three inches only taken, as the lower leaves are first attacked. Virgin soil should be used where possible, and all soil or sand used as a rooting medium should be sterilised. Basal leaves that may possibly be attacked should be burned. The plants should be kept clean and in as dry an atmosphere as practicable when housed in the autumn. Resistant and susceptible varieties of chrysanthemums are enumerated.

VARIA (G.). **Una minaccia per gli agrumeti della provincia di Trapani.** [A Menace to the Citrus Plantations of the Province of Trapani.]—*Il Rinnovamento econ.-agrar.*, xxiv, nos. 1, 2, 3-4, pp. 4-10, 38-41, 63-66. Trapani, January, February, March-April 1927.

The citrus scale, *Chrysomphalus dictyospermi*, appeared in Trapani, Sicily, a few years ago and now threatens to become a serious pest. Brief notes on its biology are followed by directions for preparing a lime-sulphur spray and for various methods of fumigation with hydrocyanic acid gas [*R.A.E.*, A, xiii, 436; xiv, 569].

RASCH (W.). **Blausäure im Dienste der Volkswirtschaft und der Hygiene.** [Hydrocyanic Acid Gas in the Service of National Economy and of Hygiene.]—*Handb. Arbeiterschutzes u. Betriebssicherheit*, reprint, 8 pp., 44 figs. Berlin. [1927.]

This is an account of the Zyklon method of using hydrocyanic acid gas for the fumigation of stores, buildings, ships, etc. [*R.A.E.*, B, xiv, 173; A, xiv, 561, etc.]

NAGEL (W.) & RASCH (W.). **Mühlenschädlinge und ihre Bekämpfung.** [Flour Mill Pests and their Control.]—*Taschenbuch des Müllers 1927 der Miag*, reprint, 10 pp., 2 pls. Brunswick, 1927.

The pests usually found in mills in Germany are briefly described and illustrated in colour, and the measures to be adopted are discussed. Under present conditions fumigation with hydrocyanic acid gas by the Zyklon method once every year or two is considered the best means of control.

BRAUN (K.). **Biologische Reichsanstalt für Land- und Forstwirtschaft, Zweigstelle Stade. Tätigkeitsbericht für die Zeit vom 1 April 1926 bis 31 März 1927.** [Report from 1st April 1926 to 31st March 1927 of the Stade Branch of the Imperial Biological Institute for Agriculture and Forestry.]—*Die Landwirtschaft*, nos. 18, 19, 20, reprint, 2 pp. Stade, 6th, 13th, 20th May 1927.

The section on insect pests deals with the apple sucker, *Psylla mali*, Schm., and nearly all the information given has already been noticed from another source [*R.A.E.*, A, xv, 228]. Carbolineum has given such good results against this pest that it was largely used in spring 1927 in the Lower Elbe districts. Instead of the 10 per cent. concentration officially prescribed, strengths of 8 and even 5 per cent. were used for early varieties of apple, which are more susceptible to injury.

ZILLIG (H.). **Spritz- und Stäubarbeiten im Weinberg.** [Spraying and Dusting in the Vineyard.]—*Biol. Reichsanst. Land- u. Forstwirtschaft*, Flugbl. 88, 4 pp., 1 fig. Berlin, May 1927.

This is a spray and dust calendar for insecticides and fungicides for vineyards in Germany.

MORSTATT (H.). **Bibliographie der Pflanzenschutzliteratur. Das Jahr 1926.** [A Bibliography of Plant Protection Literature in 1926.]—*Biol. Reichsanst. Land- u. Forstwirtschaft*, iv+231 pp. Berlin, P. Parey; J. Springer, 1927.

Previous issues of this annual bibliography have already been noticed [*R.A.E.*, A, xiv, 376, etc.]

[VUKASOVIĆ] VOUKASSOVITCH (H. & P.). **Observations sur le régime alimentaire et le phototropisme de la chenille d'*Hyponomeuta malinellus*, Zell.**—*Bull. Soc. Hist. nat. Toulouse*, liv, pt, 3, pp. 356–370, 8 refs. Toulouse, 30th September 1926. [Recd. May 1927.]

In order to find out whether *Hyponomeuta malinellus*, Zell., is polyphagous in Jugoslavia, as it has been recorded elsewhere as attacking various plants, including pear, plum, apricot and almond, the authors made careful observations in nature and also in the laboratory. They found that in the orchards observed it appeared to be confined entirely to apple. In experiments in the laboratory with a variety of food-plants it was found that though larvae taken from apple could be induced to feed for a time on cherry, quince and almond, they did not attain maturity on them.

The larvae were found to be strongly attracted to light, which explains why, in nature, their nests occur at the ends of the branches.

KEMNER (N. A.). **Jordgubbsvecklaren *Acalla comariana*, Zell., ett betydande skadedjur på jordgubbsplantor i Skåne.** [*Oxygrapha comariana* and the Injury it causes to Strawberries in the South of Sweden.]—*Medd. Centralanst. försöks. jordbruks.*, no. 315 (Ent. avdel. no. 50), 37 pp., 12 figs., 26 refs. Stockholm, 1927. (With a summary in English.)

The Tortricid, *Oxygrapha (Acalla) comariana*, Zell., was reported as a serious pest of strawberries in the south of Sweden in 1923, having in

fact appeared a few years earlier. It was probably introduced on plants. The moths, which are usually on the wing in the twilight, lay their eggs on the leaves, or occasionally on the stipules, as many as thirty being found on one leaf. The larvae feed on the leaves, but even the flowers are attacked, the stamens and pistils being devoured. The egg stage lasts 7-9 days, the larval about 40, and the pupal 10-12. As a consequence three generations a year can occur in Sweden, but generally there are two, a spring generation with larvae in May-June and moths in July, and an autumn one with larvae in August-September and moths in October-November. Hibernation normally occurs in the egg-stage on the leaves, but may take place in the larval or pupal stages. In 1923 some crops of strawberries were entirely destroyed. The outbreak had been brought to an end by 1926 as a result of the measures taken and the increase of parasites. *Microgaster laeviscuta*, Thoms., was the principal one and by 1924 in some localities had infested the majority of the larvae. It pupates in a white cocoon and often chooses the bases of the leaf-stalks or the stipules as hibernating quarters, which favours work against the pest because the leaves can be cut off in autumn without destroying the cocoons of the parasite. In the summer the pupal stage of *M. laeviscuta* lasts about 14 days; the second generation hibernates as a pupa. Other parasites that were bred were *Pimpla (Itoplectis) alternans*, Grav., which was fairly numerous; *Mesochorus* (?) *brevicollis*, Thoms.; and *Microbracon (Bracon) acallae*, Bengtsson (MS.). *Phaeogenes fulvitaris*, Wesm., was caught in the fields.

Sprays containing 1 lb. lead arsenate to 44 gals. water or 1 per mille nicotine gave poor results, possibly because the larvae were protected. In one experiment with nicotine, however, about 50 per cent. of the larvae were killed, and probably a repeated application would give good results. Cutting off the leaves at the end of September proved the most effective method. Only uninfested plants should be set out.

HUKKINEN (Y.). **Notizen über unsere Schädlinge und Nützlinge.**

3. *Notocelia rosaeocolana* Dbld. in Finland als Feind von Rosen angetroffen. [Notes on our injurious and beneficial Insects.

3. *N. rosaeocolana* found in Finland as a Pest of Roses.]—*Not. ent.*, vii, no. 1, pp. 7-10, 3 figs., 4 refs. Helsingfors, 1927.

The Tortricid, *Notocelia rosaeocolana*, Dbld., not previously known from Finland, was found there in 1925, injuring roses in greenhouses. It had apparently been introduced, the infestation being first noticed on plants from Germany. The caterpillars feed on the unopened flower-buds, young leaf-buds and leaves. In 1926, from 60 to 70 per cent. of the flowers were destroyed. By mid-May young and mature larvae and a pupa were seen. The adults emerged at the end of June and in early July, but no parasites were bred. Spraying with arsenicals should give good results.

**Tanganyika Territory. Plant Pests and Disease (Import) (No. 2) Regulations, 1927.** Government Notice, no. 62, 1 p. Dar-es-Salaam, 28th April 1927.

The Plant Pest and Disease (Import) Regulations, 1923 [R.A.E., A, xi, 520], are extended to apply to seeds of the following plants: tea from India, Formosa and Japan; para rubber [*Hevea*] from South

and Central America and the West Indies ; coconut from South and Central America and the Lesser Antilles ; cacao from South America and West Africa ; and ground-nuts [*Arachis*] from India.

MAAS (J. G. J. A.) & BOEDIJN (K. B.). **Desinfectie van door bessen-boeboek** (*Stephanoderes hampei*, Ferr.) **aangetast koffiezaad.** [The Treatment of Coffee Seed infested by *S. hampei*.]—*Meded. Algem. Proefst. A. V. R. O. S.*, Algem. Ser. no. 29, 16 pp., 7 refs. Malang [1927]. (With a summary in English.)

Experiments in the treatment of coffee seed infested by the coffee berry borer, *Stephanoderes hampei*, Ferr., are described. A few tests made with compressed air were unsatisfactory, but gave indications that success may be possible with this method. When the seed was submerged in water under pressure, very good results were obtained. At about 30 atmospheres the beetles and larvae are killed in a few seconds. A pressure of not less than 6 atmospheres requires 5 minutes and one of not less than 4 atmospheres 10 minutes ; germination is not influenced.

The favourable results obtained with the vapour from rags wetted with turpentine [*R. A. E.*, A, xiv, 438] were confirmed. For seeds put in a kerosene tin in layers alternating with the wetted cloths a period of two days' fumigation is recommended. Contact with the rags does not interfere with germination. In experiments on a small scale formalin vapour used at a high concentration gave good results, but on a larger scale the results were indecisive owing to many technical difficulties. In a series of tests with formalin, camphor and naphthaline tablets, the first two proved useless, but good results were obtained with 200 naphthaline balls to a kerosene tin used for a period of 5-10 days, the germinating power of the seed not being affected.

VANDENBERG (S. R.). **Report of the Entomologist.**—*Rept. Guam Agric. Expt. Sta. 1925*, pp. 17-20, 1 fig. Washington, D.C., October 1926. [Recd. May 1927.]

A survey showed that *Aspidiotus destructor*, Sign. (coconut scale), which was discovered in the north-western part of Guam, had spread south and then east, where the infestation was slight. A list of some of the more important food-plants of this Coccid is given. It can be found in all stages of development in any locality at any time. The average variation in the monthly mean temperature for the last seven years was less than 3° F., and there is comparatively little difference in the relative humidity of the wet and the dry seasons.

In 1923 the Coccinellid, *Cryptogonus orbiculus* var. *nigripennis*, Wse., was found to be widely distributed, and in conjunction with the emergency measures carried out seemed to have controlled *A. destructor* in some localities. If it is still present in these districts it exists in numbers too small to check the new infestation. *Aphelinus diaspidis*, How., however, will doubtless prove a factor in the control of the pest. Another small Hymenopterous parasite, which attacks only the male scale, is less numerous than *A. diaspidis*. It is thought to be a form of *Aspidiotiphagus citrinus*, Craw.

Among the more important pests recorded on the Island are *Pyrausta nubilalis*, Hb. (European corn borer), which has destroyed

as much as 50 per cent. of the maize crop; *Rhabdocnemis obscura*, Boisd. (sugar-cane borer), which also attacks coconut palms; *Leptocoris varicornis*, F., which has at different times ruined the rice crop; and at least five species of mealybugs, which do considerable damage.

TODD (F. E.). **The Cyanogas Calcium Cyanide Method of Olive Tree Fumigation in Spain.**—*Res. Devpmt. Cyanogas Calcium Cyanide*, Sect. 1, pp. 39–50, 1 fig., 1 table. New York, N.Y., The American Cyanamid Sales Co., 1927.

The principal insect pests of the olive in Europe are: *Phloeothrips oleae*, Costa (olive thrips), *Euphyllura olivina*, Costa (olive psylla), *Aspidiotus hederae*, Vallot (white olive scale), *Saissetia oleae*, Bern. (black olive scale), *Phloeotribus scarabaeoides*, Bern. (olive twig borer), *Prays oleellus*, F. (olive twig moth) and *Dacus oleae*, Gmel. (olive fly).

Investigations in Spain have shown that tent fumigation with hydrocyanic acid gas is the only effective control measure against *P. oleae*, which is by far the most important of these insects in regions favourable to its development (the higher slopes of mountains). This method also proved effective against *E. olivina*, *P. scarabaeoides*, *A. hederae*, and *S. oleae*, as their most vulnerable stages occur during the fumigation season for *P. oleae* (October to March). *S. oleae* will, however, probably require an increased dosage.

*P. oleae* has three generations a year. The adults hibernate from October to March in a more or less active state, according to the temperature, within the abandoned burrows of *P. scarabaeoides* or in tightly curled leaves. They depend on the wind or other natural agencies for dissemination, as they are inactive and their wings are too weak to allow them to fly. Each female lays about 30 eggs. Both nymphal and adult stages feed on the leaves and fruit of the olive tree, which is weakened, and in extreme cases even killed, while production is reduced and the quality of the oil deteriorates. Yields are doubled or trebled after treatment with hydrocyanic acid gas, and one fumigation, giving a kill approximating 100 per cent., is effective for from three to five years.

Experiments with Cyanogas calcium cyanide "A" dust [R.A.E., A, xiv, 74] were carried out from October 1925 to March 1926. Open air dusting at the rate of 2 to 3 lb. to each tree kills 80 to 90 per cent. of the thrips, but tent fumigation is much more satisfactory. The percentage of kill can be fairly accurately determined by shaking the tree over a white cloth and counting the dead and live thrips falling upon it. Any recovery from fumigation will have taken place 24 hours after treatment. Applications made by raising a side of the tent and directing the nozzle toward the leafy top of the tree, at the rate of 20 per cent. of the standard dosage table for *Citrus* [R.A.E., A, xiv, 247], resulted in kills of from 98 to 100 per cent. A fumigation chart, based on this dosage, which has now been generally adopted, is given. Such applications, dusting the crown of the tree thoroughly, gave as good results with 30 per cent. less dosage as indirect applications made by blowing the dust toward the ground, as the dust was placed in intimate contact with the insects and even introduced into some of the borer holes. In the warmer weather of the late spring the same results can be obtained with 16 per cent. of the standard dosage for *Citrus*. Exposures of one hour resulted in better kills than exposures of 30 or 45 minutes, and the best results were obtained at temperatures above

40° F. The dusters used were of the fan type, one of them having a device that automatically measured 24 grams to the unit.

The olive tree blossoms in the latter part of April, the fruit forming in May and ripening in November and December. As the harvest season is from November to January the fruit is still on the trees during the first half of the fumigation season, but no injury results from the use of calcium cyanide after the fruit has become sufficiently hardened in the latter part of August, so that fumigation can be carried out either before or after the harvest.

The superiority of calcium cyanide over sodium cyanide is pointed out, its chief advantages being that it is far less costly in operation, and while equally effective, can be applied with greater safety, rapidity and accuracy. Comparative tables of results obtained show that only about 25 per cent. more calcium cyanide by weight is required to produce results equal to those obtained with sodium cyanide.

**MALENOTTI (E.). Nemici poco note del frutteto. Le false lucciole.**

[Little known Orchard Pests. The False Fireflies.]—*Note di Frutticoltura*, v, no. 6, reprint, 10 pp., 3 figs. Pistoia, 1927.

The Telephorid beetles, *Cantharis obscura*, L., *C. rustica*, L., and *C. fusca*, L., have appeared of recent years in considerable numbers in Venetia. They attack the blossoms of apple, pear, peach, plum and cherry and the newly-formed fruits of apricot if the flowers are not available. In the case of an infestation of peaches by *C. obscura* it was observed that the rows of trees adjoining a field of turnips in flower were those severely attacked, whereas those distant from the turnips were almost untouched. Control is effected by jarring the trees in the morning when the beetles are inactive and collecting the latter on sheets. A lead arsenate spray applied before blossoming seems preferable, as the jarring causes the fall of some blossoms.

**KIEBLER (—). Beobachtungen betr. Frostspanner im Frühjahr 1927. (Umgebung Schaffhausen).**

[Observations on the Winter Moth around Schaffhausen in Spring 1927.]—*Schweiz. Zeitschr. Obst- u. Weinbau*, xxxvi, no. 12, pp. 207–210. Wädenswil, 11th June 1927.

This is a continuation of the report on the occurrence of the winter moth [*Cheimatobia brumata*, L.] in the autumn of 1926 in Schaffhausen [*R.A.É.*, A, xv, 166], and refers to the infestation in the spring of 1927. In spite of careful banding, from one-quarter to two-thirds of the cherry crop was destroyed in several localities. Banding is thus of secondary value only, not simply because of the possibility of females being carried over the bands [*loc. cit.*], but also for other causes, of which one suggested here is that eggs laid on the bark below the bands yield caterpillars about mid-April, when they can easily climb up, as the banding is usually removed at the end of February. Thorough disinfection of the trunk below the band seems necessary. Experiments proved that the caterpillars can live for many days and travel considerable distances without feeding, though from the ninth day onwards they become inactive. The conclusion reached is that spraying early with lead arsenate is the only reliable measure.

SCHÖNBERG (F.). **Zur Entwicklung des grossen Waldgärtners.** [On the Development of the Large Pine Beetle.]—*Der deutsche Forstwirt*, 1925, pp. 887–888. (Abstract in *Neuheiten Geb. Pflanzenschutzes*, 1927, no. 2, pp. 55–56. Vienna, June 1927.)

Observation of bark from standing or felled pine trunks kept indoors showed that in cases of infestation by the large pine beetle [*Myelophilus piniperda*, L.] the bark from a trunk 6ft. high and 8 in. in diameter can produce about 1,800 beetles. It is absolutely necessary to burn the bark on removal.

DINGLER (M.). **Die Darstellung der Generationenfolge bei den Pflanzenläusen.** [The Representation of the Sequence of Generations in Aphids.]—*Forstw. Centralbl.*, xlviii, pp. 572–578, 4 figs. Berlin, 1926. [Recd. June 1927.]

The usual method of representing diagrammatically the sequence of generations in Aphids by means of circular lines does not indicate the chronological sequence so clearly as the method here described. The life-history is shown in vertical columns. One column represents the chief food-plant, and an arrow running down through it indicates the life-cycle of the insect. When an intermediate food-plant occurs, it is represented by a parallel column into which the arrow runs, returning to the main column when a return migration takes place. Horizontal cross lines intersecting the columns represent the limits of the calendar years. The various forms of the insect are shown in ovals drawn on the arrow line.

DINGLER (M.). **Schutz gegen Tiere.**—HESS-BECK, *Forstschutz*, 5th edn., i, Lief. 6, pp. 481–588, 68 figs., refs. Neudamm, J. Neumann, 1927. Price M.4.

This is the sixth and final part of the volume on animal pests of forests already noticed [*R.A.E.*, A, xv, 382] and is on the same lines as the preceding parts. The section on Lepidoptera is completed, pp. 481–517, and is followed by those on Diptera, pp. 518–523, Orthoptera, pp. 523–526, and Rhynchota, pp. 526–551, with a few pages on Arachnids, etc.

A list is given of the important forest trees under the popular names of the genera, with the pests that affect them, the part of tree attacked and the importance and time of occurrence of the pest being indicated. An index to the complete volume is included.

v. Lengerken (H.). **Coleoptera IV.**—*Biol. Tiere Deutschlands*, Teil 40, pp. 169–346, 74 figs., 10 pp. refs. Berlin, Borntraeger, 1927.

Wichmann (H. E.). **Ipidae.**—*Op. cit.*, Teil 40, pp. 347–381, 29 figs., 19 refs.

Vogel (R.). **Lampyrinae.**—*Op. cit.*, Teil 40, pp. 382–391, 6 figs., 7 refs.

URICH (W.). **Strepsiptera.**—*Op. cit.*, Teil 41, 103 pp., 47 figs., 2 pp. refs.

In these further sections of this work [*R.A.E.*, A, xi, 199] the general section on Coleoptera [A, xiii, 601] is concluded. The sections on the Scolytids, Lampyrids and Strepsiptera follow the same lines as those on the Coleoptera in general.

QUANJER (H. M.). **Een aaltjesziekte van de aardappelplant, de aantastingswijze en de herkomst van haar oorzaak, *Tylenchus dipsaci*, Kühn.** [A Nematode Disease of the Potato Plant, the Method of Infection and the Origin of its Causal Agent, *T. dipsaci*.]—*Tijdschr. Plantenziekten*, xxxiii, no. 6, pp. 137–172, 1 fig., 5 pls., 49 refs. Wageningen, June 1927. (With a summary in German.)

*Tylenchus dipsaci* was introduced in 1921 in seed-potatoes from Poland into the Dutch province of Limburg, and observations on it are here recorded in detail. This Nematode infests the potato sprouts when they appear at the surface of the ground. The larvae penetrate by the stomata and live in the intercellular spaces. At the beginning of summer the Nematodes that have developed from eggs in the galls they produce migrate to the tubers, and several generations develop in the latter. When the infested tubers are planted, the Nematodes in them migrate to the soil and from there infest the potato sprouts. The ground remains infested for several years. After completing six generations in the potato, *i.e.*, about as many as occur in a year, *T. dipsaci* is capable of infesting numerous plants of widely different families. A list is given of plants attacked by this Nematode when near infested potatoes.

KOESLAG (J. D.). **Korte mededeeling over een proef over het weerstandsvermogen van verschillende roggeselecties en roggerassen tegen het stengelaaltje.** [A Short Note on the Resistance of various Strains and Varieties of Rye to the Stem Eelworm.]—*Tijdschr. Plantenziekten*, xxxiii, no. 6, pp. 173–176. Wageningen, June 1927. (With a summary in German.)

Experiments are described that indicate the possibility of breeding a race of rye very resistant to infestation by *Tylenchus dipsaci*, Kühn.

PAMPLONA (A.). **Divulgação, pelo cinema, dos methodos de combate á broca do cafe no Estado de São Paulo.**—*Comm. Estudo e Debeliação da Praga Caféiera*, Pub. no. 19, 104 pp., 25 pls. S. Paulo, 1927. (With a summary in English.)

An account is given of the use of a cinematograph film for popularising knowledge of the damage done by *Stephanoderes hampei*, Ferr. (*coffeae*, Hag.) in Brazil and of methods for controlling it.

PARROTT (P. J.). **A Survey of Important Insects and Spray Developments.**—*Proc. 72nd Ann. Meeting New York State Hortic. Soc.*, pp. 4–13. Rochester, N.Y., 1927.

This is an account of the occurrence and control of insects found in New York during 1926, many of which have been noticed previously [*R.A.E.*, A, xiv, 170, 276, 633; xv, 252, 258.]

Apples were attacked by the potato leafhopper, *Empoasca fabae*, Harr., and the rose leafhopper, *Typhlocyba (Empoa) rosae*, L. Though no treatment has yet been devised affording complete control, spraying with lime-sulphur affords noticeable protection from these insects. Bordeaux mixture is more effective against the young nymphs, but will

russet apples if applied to trees carrying a crop. Other pests of apples included the apple maggot [*Rhagoletis pomonella*, Walsh] and the codling moth [*Cydia pomonella*, L.].

The peach borer [*Aegeria exitiosa*, Say] appeared to be more numerous than usual. Although immense numbers of the cotton moth, *Alabama argillacea*, Hb., appeared in the autumn in the western part of the State and attacked peaches and plums [cf. *R.A.E.*, A, xv, 403], no appreciable damage was done. Owing to the omission of the lime-sulphur treatment, there was a serious recrudescence of the blister mite [*Eriophyes pyri*, Pag.] on pears after a long period of quiescence.

The rosy aphid [*Anuraphis roseus*, Baker] was remarkably scarce on apples during the year; the reason for this is uncertain, but it may have been due to adverse conditions on the alternative food plant (plantains) in the preceding summer.

White oil emulsions, which are made from white mineral oil with the addition of an emulsifier such as calcium caseinate, are more expensive than the common lubricating oil emulsions or commercial miscible oils, but, owing to a refining process that removes the unsaturated hydrocarbons, they are safer for use on foliage. These emulsions, the range of utility of which has yet to be determined, have proved valuable for foliage treatment to combat red spider [*Tetranychus*] and certain scale-insects, but only remain toxic to the eggs of *C. pomonella* for one week after application. Though apples and peaches receiving several applications during midsummer have suffered no apparent injury, the cumulative effect of repeated treatments over a period of years can only be determined by actual experiment.

PORTER (B. A.). U.S. Bur. Ent. **Lubricating Oil Emulsion.**—*Proc. 72nd Ann. Meeting New York State Hortic. Soc.*, pp. 26-37. Rochester, N.Y., 1927.

This paper gives a review of experimental work and commercial practice in the use of lubricating oil emulsions, beginning with the formula that has given excellent results against the San José scale [*Aspidiotus perniciosus*, Comst.] [*R.A.E.*, A, xi, 337]. This emulsion contains approximately 66 per cent. of oil, the actual amount varying according to the evaporation of water and the extent of frothing caused by pumping. Although the most effective constitution of oil for spraying purposes has not yet been established, oils tested for scale control in Indiana and Illinois gave satisfactory results with viscosity between 90 and 250 seconds (at 100° F., Saybolt test), a specific gravity varying from 0.87 to 0.93 (at 20° C.) and a volatility not exceeding 2 per cent. (105-110° C. after 4 hours). These include many of the oils known as red engine oils and those used as floor dressings or for lubricating slow-moving bearings. In the southern apple section the oils most used have a viscosity of 180 to 225, while further north oils with a viscosity of from 90 upwards have given equally good results at less expense. Where soap is rendered insoluble by the hardness of the water, a Bordeaux mixture ( $\frac{1}{2}$  lb. bluestone,  $\frac{1}{2}$  lb. lime and 50 U.S. gals. water) may be substituted for it.

If the emulsion, which will withstand a somewhat lower temperature than water without freezing, is thawed too suddenly, the oil may separate, in which case the stock must be emulsified over again. While a 2 per cent. content of oil proved effective in scale control in the Middle West, in other areas 3 per cent., and in the North West even 4 per cent.,

appears to be necessary in some cases. The emulsion, if well made, will remain in good condition for several months, but is unsuitable for long distance shipment, and is usually made locally. If left to stand for long periods, it should be well stirred before use to break up the separate layer of brown liquid composed of the excess soap and water that tends to form at the bottom of the container.

Cold mixed emulsions prepared with an emulsifier other than soap, such as casein-lime, freshly made Bordeaux, very fine clays, glue and similar materials, include formulae in which colloidal clays are employed [*R.A.E.*, A, xiii, 428; xiv, 14]. Some clays, such as bentonite, require smaller amounts than are needed in the case of kaolin; larger amounts produce an emulsion that is so stiff that pumping is very difficult. Owing to their relative instability and the fact that they will keep only for short periods, emulsions made with casein-lime and with Bordeaux mixture should be made as needed. Cold-mixed emulsions are unaffected by hard water, but some may be affected by freezing. Many of these emulsions tend to layer or cream when diluted, and in such cases should be well stirred. At greater strengths than 1 or  $1\frac{1}{2}$  per cent., at which low concentration the oil appears to lose some of its efficiency, combinations of these emulsions with Bordeaux, which are rapidly coming into general use in the Middle West as dormant peach sprays, secure a perfect kill of scale and are also effective against peach-leaf curl. A uniform distribution of oil may be secured without making a stock emulsion by pumping the lubricating oil directly with the Bordeaux in the tank when it is about one-third full.

Although cold-mixed emulsions, in contrast to soap-oil mixtures, combine readily with lime-sulphur, such compounds are more likely to cause injury to plant tissue than when either component is used alone.

Injury to trees by strictly dormant spraying hardly ever occurs, even when it has been carried out for several successive seasons; the danger is greatest when spraying is followed immediately by a sudden drop to a very low temperature, so that it is advisable not to spray when temperatures fall below 40° F. Though instances of injury have been reported when applications have been made very late, cold-mixed or boiled emulsions, if properly prepared, are fully as safe as miscible oils.

The summer use of oil for San José scale is only partly effective, as the scales are larger and harder to kill than with dormant sprays and the foliage prevents a complete covering. On apple serious foliage injury resulted on some varieties from spraying during extremely hot weather, though in the majority of cases no injury occurred from summer treatment at  $1\frac{1}{2}$ –2 per cent. strength. Slight spotting of the fruit and a dull, greasy finish, tending to gather dust and dirt, result from the application of oil within a month or two of harvest. Similar objections apply to the summer use of the highly refined white oils, but although they are more expensive and not superior to other oils in their effect on insects, they are less toxic to plant tissue. Ordinary lubricating oil emulsions have generally caused partial or complete defoliation on peaches at 2 per cent. and considerable injury at 1 per cent., while in excessively hot weather even white oils used in excess of 2 per cent. are likely to cause some damage.

The results obtained with oil emulsions by various workers against insects other than *Aspidiotus perniciosus* are briefly reviewed.

By numerous tests and extensive commercial practice it has been demonstrated that only about half as much oil is needed for maximum efficiency with lubricating oil emulsions as when the material is used in the form of a miscible oil. The most efficient oil spray is one in which the oil is most ready to separate out and the least efficient is one in which the oil remains in suspension for the longest time, the coarser droplets running together to form a continuous film and the finer droplets constituting a more stable but less effective emulsion. If, however, the oil is too ready to separate, the emulsion will break down in the tank.

MUNDINGER (F. G.). **Some Experiments relative to Insect Control.**—*Proc. 72nd Ann. Meeting New York State Hortic. Soc.*, pp. 138–145. Rochester, N.Y., 1927.

In order to obtain data on the emergence of the apple maggot [*Rhagoletis pomonella*, Walsh], cheese cloth cages covering 40 sq. ft. of ground were placed under several varieties of trees on plots of various exposures and conditions. Tables are given showing the total emergences on specific dates and over specific periods, and the number of emergences classified according to various conditions. The flies emerged between 23rd June and 13th August, the numbers fluctuating irregularly at different periods during this time. Heavy rain fell during a rapid increase of emergence that occurred following 12th July, and the maximum coincided with the highest temperatures of the season between 16th and 27th July, though no new flies appeared after 13th August in spite of rainfall and several very warm days.

The effects of various insecticides, etc., were tested on flies in small cages attached to trees and containing foliage and fruit, on which the materials were sprayed or dusted. Some of the insects lived as long as 15 days, and those fed on sweetened liquids lived longer than others, lime-sulphur and lead-arsenate causing death more quickly without the addition of sugar. Lead arsenate or calcium arsenate with the addition of casein-lime and water, lead arsenate dust or Bordeaux and lead arsenate spray all proved toxic within four days.

The results are given of tests with various sprays and dusts combined with subsequent daily sprayings with sugar-water or plain water or with no treatment except the original spray. The sugar-fed flies lived longest, those receiving no attention dying most quickly. In the case of lead arsenate dust, however, more flies were killed in four days in the cage sprayed with water than in the untreated one. As the flies exhibited a great liking for moisture and showed no distaste for lime-sulphur lead-arsenate spray, it was concluded that the time at which they would consume most poison would be directly after spraying or while the foliage was wet with dew or rain. No egg-laying was seen in the cages, and among numerous females dissected only in one or two of those fifteen days old were eggs found developing.

Dustings made in the late summer showed a 40 per cent. kill with calcium cyanide "S" dust [*R.A.E.*, A, xiv, 555] and a 90 per cent. kill with a mixture of 20 lb. calcium cyanide "A" [xiv, 74] and 15 lb. hydrated lime on warm days when humidity was above the average.

Among numerous measures tried against the pear psylla [*Psylla pyricola*, Först.] soap and nicotine sprays consisting of 5 lb. soft soap,

1 U.S. pt. nicotine sulphate and 100 U.S. gals. water, and 2.5 and 3 per cent. commercial oil emulsions proved toxic to adult flies. "Cocotine" [an emulsion of coconut fatty acids] gave rather less satisfactory results. Lime-nicotine dust, 20 per cent., produced high percentages of kill on warm, quiet days. Various miscible oils used when the trees were in bud failed to show sufficient toxicity against the eggs. Bordeaux mixture, lime-sulphur 1-40 with 20 lb. tobacco dust, and 100 U.S. gals. miscible oil with 1 U.S. pint nicotine and 20 lb. lime, produced good results against newly appearing nymphs. Dusts containing hydrated lime and plaster of Paris [*R.A.E.*, A, xiv, 278], including a mixture of 30 lb. lime, 10 lb. plaster of Paris, 10 lb. sulphur, and 1 U.S. pint nicotine sulphates also killed the nymphs.

A light miscible oil spray with 1 U.S. pt. nicotine sulphate gave the highest kill and the greatest penetration of several oil sprays applied to pear trees infested with thrips [*Taeniothrips inconsequens*, Uzel].

Various insecticides tried against the pear midge [*Contarinia pyrivora*, Riley], just as the pear blossoms were beginning to open, proved ineffective, but it appeared that the adults must have laid their eggs before the applications had been made.

SHEAR, JR. (E. V.). **Results in Use of Oil Sprays in the Hudson Valley.**—*Proc. 72nd Ann. Meeting New York State Hort. Soc.*, pp. 146-148. Rochester, N.Y., 1927.

Though the use of Bordeaux-oil spray on apple trees during the delayed dormant or pink periods did not result in any stimulation or retardation of growth, oil, with or without Bordeaux, applied late in the afternoon previous to light night frosts that caused no injury to unsprayed leaves, resulted in browning the tips of rosette leaves, while lime-sulphur 1-8 applied at the same time caused slightly more scorching. Oil emulsions and miscible oils are apparently equally toxic at equivalent strengths. Emulsions are cheaper and are rather more stable when used under adverse conditions. Miscible oils will stand storage better, and some of the commercial varieties have been standardised, though their constancy cannot be relied on in all cases.

Though good results have been obtained with highly refined emulsified white oils as a summer spray for fruit and foliage, lubricating oils are apparently equally satisfactory at one-third of the cost. Lubricating oils fully meet the requirements for delayed dormant sprays, and dosages up to 2 per cent. actual oil were used with good results as a summer spray against mites.

White oils used at strengths of up to 2 per cent. actual oil caused no injury to foliage or fruit of raspberry plants, and all mites and Aphids hit were killed, though their position on the lower surfaces of the leaves protects them against ordinary methods of spraying.

SHEAR, JR. (E. V.). **Removing Spray Residues from Fruit.**—*Proc. 72nd Ann. Meeting New York State Hort. Soc.*, pp. 149-151. Rochester, N.Y., 1927.

Apples rendered unsaleable by spray residue after several applications of Bordeaux, the last of which did not contain lead arsenate, were treated with hydrochloric acid. Even before treatment they did not

carry the minimum quantity of arsenic allowed. The solutions used varied from 1 : 10 to 1 : 800, at which strength a one minute immersion failed to remove all spray residues. No injury was noted at weaker than 1 : 100, and 1 : 500 proved both safe and effective. The treatment of 900 barrels of apples with the 1 : 500 solution employed two men for eight hours and required 75 U.S. gals. of the dilute solution costing about 1s. 6d. The testing of the solution, which was necessary after every 30 or 40 barrels of apples, was effected by measuring 10 cc. of it into a graduated jar and adding a drop of phenolphthalein. Sodium hydroxide solution, so constituted that 10 cc. sodium hydroxide would just neutralise 10 cc. of the 1 to 500 acid solution, was then added until the solution turned pink. If 8 cc. of the sodium hydroxide was required, the acid solution was eight-tenths of its original strength and two-tenths of the original amount of acid was added to the acid bath.

When apples were placed in cold storage at 32° F. at 78–100 per cent. humidity no injury appeared on those with unbroken skins, though slight amounts of injury were found at the edges of cuts on apples treated and unrinsed. Fruit rinsed after treatment was undamaged and withstood storage at least as well as untreated fruit. Condensation of the slight salt residue on apples dipped in acid without being rinsed in water occurred at 95–100 per cent. humidities, while humidities of 90 per cent. gave no condensation. Rinsed fruit was entirely free from this. Chemical analysis of treated and untreated apples showed that about 75 per cent. of the arsenic was removed. A neutralising bath of soda, 1 lb. to 100 U.S. gals. water, formerly recommended, has been found unnecessary.

None of the numerous acids, bases and salts tested by Hartman and Robinson have proved as satisfactory as hydrochloric acid. They record injury to apples with 1 : 50 dilution of this substance after five minutes at 50° F., with 1 : 100 after ten minutes at 50° F., and with 1 : 300 after ten minutes at 95° F. The advantages of hydrochloric acid, as summarised by them, are that it is cheap and available in large quantities, non-injurious to fruit immediately or in storage and non-oxidising, removes lime, copper, lead, etc., as well as arsenic, is easily rinsed from fruit, volatile, harmless, pleasant to handle and effective at low as well as at high temperatures at great dilutions.

Various mechanical wipers and brushers tested did not prove satisfactory in removing material from the stalk and calyx ends. One machine has been produced that sprays the apples with hydrochloric acid and subsequently wipes them dry.

PARROTT (P. J.) & HARMAN (S. W.). **The Peach Cottony Scale.**—*New York State Agric. Expt. Sta.*, Circ. 89, 8 pp., 2 pls. Geneva, N.Y., 1st November 1926. [Recd. May 1927.]

Most of the information in this circular is the same as that given in a previous paper [*R.A.E.*, A, xiv, 277]. The use of oil sprays in combination with lime-sulphur or Bordeaux mixture in late autumn or early spring against the peach cottony scale [*Pulvinaria* (?) *amygdali*, Ckll.] and peach leaf-curl is discussed; not only is it more economical to apply these two sprays together, but weather conditions often render two separate applications in the early spring very difficult. Lubricating oil emulsions and certain miscible oils can be mixed with lime-sulphur or Bordeaux mixture, and the combined sprays are effective against the

Coccid when applied in the spring, but it has not yet been shown conclusively under New York conditions that they are effective against leaf-curl, or that they can be used without danger of injury to the trees, especially if applied in the autumn.

HARMAN (S. W.). **The Peach Cottony Scale.**—*New York State Agric. Expt. Sta.*, Bull. 542, 19 pp., 3 pls., 5 figs. Geneva, N.Y., March 1927.

The stages and seasonal history of the peach cottony scale, *Pulvinaria* (?) *amygdali*, Ckll., are described. Mature ovisacs of healthy females contain about 4,500 eggs each; egg-laying and the formation of the ovisac begin at about the time that the peach petals fall, usually in the latter part of May or early in June, and the eggs hatch over a period of 3–4 weeks in June or July. The newly hatched larvae seek the new growth or the lower surfaces of the leaves, congregating along the midribs and larger veins of the latter. Before the leaves fall the female scales migrate to the younger twigs and branches and the callus around pruning scars, etc., where they continue to feed until influenced by low temperatures and the diminished sap supply, after which they remain dormant until the sap begins to flow again in the spring, when further growth occurs and the ovisacs develop.

Details are given of experiments with lubricating oil emulsions, miscible oils and white oil emulsions, a summary of the results of which has already been noticed [*R.A.E.*, A, xv, 258]. The properties of the three lubricating oils used in making the emulsions are given, and the results of autumn and spring applications of these and of commercial oil emulsions and miscible oils at various strengths are tabulated. In some instances sprays containing 2 per cent. oil gave efficient control, but they were not wholly dependable at this strength, and it is considered that 4 per cent. sprays are most suitable from the standpoints of efficiency and economy, although 6 per cent. ones usually gave slightly better control; moreover it is perhaps advisable that sprays containing more than 4 per cent. oil should not be used, on account of possible injury to the trees. In the main, miscible oils diluted to the maximum strength recommended for peach orchards by the manufacturers gave satisfactory results without evidence of injury to the trees. It is recommended that oil sprays should be applied as a fine mist on warm days in the spring, and that their use should not be continued after the trees are free from *P. amygdali*, in order to avoid risk of cumulative injury, as it has been shown conclusively that lime-sulphur affords efficient protection against the San José scale [*Aspidiotus perniciosus*, Comst.].

THORNE (G.). **The Life History, Habits and Economic Importance of some Mononchs.**—*Jl. Agric. Res.*, xxxiv, no. 3, pp. 265–286, 6 figs., 4 refs. Washington, D.C., 1st February 1927. [Recd. May 1927.]

The following is taken from the author's summary: Four Nematodes of the genus *Mononchus* inhabit the sugar-beet fields of Utah and southern Idaho, viz., *M. papillatus*, Bastian, *M. macrostoma*, Bastian, *M. signaturus*, Cobb, and *M. parabrachyurus*, Thorne. These species often occur in beet fields infested with another Nematode, *Heterodera schachtii*, Schmidt. They prefer the lighter, sandy soils, where they sometimes occur at as high a rate as 300,000,000 to the acre. In the heavy soils they occur much less frequently. A study was made for

the purpose of determining if these Nematodes were of economic importance in the control of *Heterodera schachtii*. Their general habits in relation to temperature, moisture, food-supply, and diseases and enemies were also studied. Their principal period of reproduction occurs during the months of March, April, and May, and there is probably but one generation each year. Their abundance varies greatly from year to year. *Mononchus macrostoma* and *M. parabrachyurus* are attacked by Sporozoan parasites, and other undetermined causes greatly reduce their numbers. *Mononchus papillatus* was found to be the most voracious species and was frequently observed devouring the larvae and males of *H. schachtii*. The other three species appeared to prefer rotifers and other micro-organisms as food. Because of their varying incidence, time of reproduction, and food habits, it is doubtful if the species studied were of economic importance in the control of *H. schachtii*. Nematode activity ceased when the soil moisture content dropped to 7 or 8 per cent. in two fields under study. *Mononchus* spp. are able to lie dormant through the dry summer months, but revive in 10 to 20 minutes when water is applied to the soil. *Mononchus parabrachyurus* appeared to migrate deeper into the soil during the hot summer months, but the other species studied were not apparently influenced by temperature.

PRESTON (J. F.). **Control of Bark Beetles on the National Forests.**—*Jl. Forestry*, xxiii, no. 1, pp. 49-61. St. Paul, Minn., January 1925. [Recd. May 1927.]

In the National Forests of the United States the chief insect problem is the bark-beetles of the genus *Dendroctonus*, which occur normally under endemic conditions in such circumstances that the expense of control measures would be greater than the value of the timber saved, but which occasionally cause epidemics that require very prompt measures of suppression. A good deal of information on the various species has previously been noticed [*R.A.E.*, A, xiv, 81, 242, etc.]. The indications are that bark-beetle epidemics occur in cycles, but the factors determining the course of an infestation are not definitely known. Apparently one important factor is the continuity of timber suitable for breeding; weather conditions quite probably have some bearing upon it, and there is some evidence to indicate that the altitude range of the tree has some influence, the beetles sometimes being able to attack successfully only trees above or below a certain optimum habitat. The adults fly short distances, probably not exceeding a few hundred yards normally and never more than about half-a-mile. Having penetrated the bark the adults hollow out a channel next to the cambium, and after mating the female deposits her eggs in it, both sexes throwing out sawdust and constructing ventilation holes. The young larva constructs a fresh channel, generally at right angles to the parent one, and makes an exit hole through which, after pupation, it emerges as an adult. While the life-histories of all species of *Dendroctonus* are in the main the same, there are minor differences, for example, *D. ponderosae* (black hills beetle) has only one generation a year and lives entirely in the cambium under the bark; *D. brevicornis* has several generations in a year and lives in rather than under the bark.

Systematic observation of the forests year by year is the only means of judging when epidemics are about to occur. The group method of attack, that is, infestation increasing from a definite centre, is not

always the beginning of an epidemic ; it is often found to be so in the case of *D. ponderosae* and to some extent with *D. brevicomis*, but it is no indication of an epidemic in the case of *D. monticolae*. As soon as epidemic conditions are found, it is essential to survey the territory to determine the extent of the attack, and evidence should be collected by following strip lines through the timber for several seasons and comparing the conditions. Epidemics are at present being fought on two areas covering over 100,000 acres ; in these cases failure to observe the signs in the forests in 1919 and 1920 and to survey and collect evidence in the early stages has resulted in the destruction of a hundred million feet of valuable yellow pine and the expenditure of some £10,000 in the attempt to stop the spread of the damage. Epidemics in other areas have been running their course for 10 and 15 years without showing signs of abatement. There is no way of saving trees when they are once attacked in force by the beetle ; the only successful method is to fell infested trees and destroy the immature stages in process of development. Simply peeling off the bark and exposing the immature insects is sufficient to kill *D. ponderosae* and *D. monticolae*, but it is usually necessary to burn the bark of trees infested with *D. brevicomis*, as it is found in the bark rather than under it.

Hopkins, when evolving his percentage theory of control, suggested that 60 to 75 per cent. of infested trees throughout the epidemic area should be cut, leaving parasites and predators to complete the extermination of the remaining insects. This method, however, has not proved an invariable success in practice. Another theory has now been advanced, namely, that when an infestation in a particular spot has reached its height, the most vigorous individuals advance into new territory, leaving the weaker ones to carry on the original infestation to its close. An attempt will therefore be made to suppress such migration by the entire clearing of a strip in the line of advance, and if this succeeds, it will be far less expensive than any attempt to clear the entire area, though the timber losses will be heavier.

Artificial control is always justified when the area is small and the epidemic is increasing ; when an epidemic is already established over a large area, the advisability of control will depend on the value of the timber. It has recently been estimated that control has cost from 12s. to £1 per thousand feet for the trees actually felled. It is considered that any stumpage values exceeding 8s. per thousand feet would probably justify control measures, but in every case it is necessary to balance the cost of control against conservative estimates of the value of timber to be saved, and where stumpage values are 8s. or less, control work cannot be justified from a commercial point of view. It is useless to try to deal gently with an epidemic ; prompt and drastic treatment is required, followed by expenditure on a smaller scale for at least several seasons until the epidemic is reduced to endemic proportions. Statistics and records of control measures in past years are given. It is considered a conservative estimate to reckon an annual loss of not less than 500 million feet in the National Forests, and a monetary loss of some £100,000 to £500,000 due to insect depredations. This loss is largely from insects in the endemic status, and practically nothing can be done to minimise it, but epidemics are a different problem and must be faced promptly. The ultimate solution of the problem will not be possible until the value of timber has increased to a point that justifies intensive management of the heavily timbered forests and the appointment of many more field officers to watch and deal with the situation ; the

over-mature trees will then be promptly replaced with young, growing stock, the annual cutting operations will furnish freshly cut logs to attract and feed the bark-beetles, which can then be destroyed, and the elasticity of the cutting programmes will enable the forester to alter the time of logging in order to check any threatening epidemics, and with such management the toll of insect depredations should be very small. The technique of control measures should be prescribed by the entomologist, but the responsibility for protection of the forest lies with the forester.

Box (H. E.). **The Moth Borer Problem in Barbados. A Discussion and a Recommendation.**—*Barbados: Dept. Sci. & Agric.*, 5 pp. multigraph. Barbados, 25th March 1927.

Attention is drawn to the serious nature of the damage to sugar-cane caused by *Diatraea saccharalis*, F. (sugar-cane moth-borer) in Barbados, both by destruction of young canes and by reduction of the quantity and quality of the juices in those that are not killed by the attack. *D. saccharalis* is the most important pest of sugar-cane in America and the West Indies, except Trinidad, where it is apparently controlled by parasites, and it is a factor of primary importance to the future of the sugar industry. The author estimates that in the Neotropical countries north of the Equator the moths of this genus cause an annual loss of not less than £2,000,000, and considers that but for its parasites sugar-cane could not be grown profitably in these countries. Although artificial control measures may reduce infestation locally, little good can be done without some measure that will reduce the general infestation throughout each country concerned. The author believes that this can be effected by the introduction of parasites. The only parasite of *D. saccharalis* hitherto known in Barbados is *Trichogramma minutum*, Riley, which parasitises 60 per cent. of the egg-masses, but in British Guiana there are various Braconids (*Ipobracon* spp. and *Microdus* spp.) that attack the larvae, but are prevented from exercising their full influence in that country by the cultural methods practised, and in Porto Rico the larvae are parasitised by a Tachinid, *Lixophaga (Euzenilliopsis) diatraeae*, Towns., which has apparently reached the limit of its effectiveness there. In Barbados, however, these parasites would not be under the same limitations, and the author suggests that an organised attempt should be made to introduce them, believing that they could be established, and that they would eventually bring *D. saccharalis* under complete control. The establishment of the Braconids would be greatly aided by the planting of *Cordia interrupta*, which is also of value in encouraging *Tiphia parallela*, Smith [cf. *R.A.E.*, A, xv, 412, 413].

REGAN (W. S.). **Relative Value of Different Insecticide Treatments for the Control of Codling Moth in the Pacific Northwest.**—*Jl. Econ. Ent.*, xx, no. 2, pp. 249–250. Geneva, N.Y., April 1927.

Only an abstract of this paper is given, in which it is stated that the results of numerous tests and observations on the control of *Cydia (Carpocapsa) pomonella*, L. (codling moth) including investigations on the best dosage of lead arsenate, the value of spreaders, the dates of spraying, the use of an oil spray as an ovicide and the effect of various spray treatments on the removal of spray residue by wiping,

are discussed. In the discussion that followed the author stated that 8 per cent. infested fruit was found by one grower after three applications of oil, 6 per cent. after four applications of lead arsenate alone, and 2 per cent. after four applications of lead arsenate and oil combined. Growers found that oil alone gave fair results, and was more satisfactory on pears than on apples, on some varieties of which there were unfavourable reactions. W. P. Flint stated that in Illinois 42 per cent. infested fruit occurred on a block of apples treated solely with oil except for the regular lead arsenate calyx spray, as compared with 16 per cent. on a block sprayed with lead arsenate, while on the oil-sprayed block 45.9 per cent. of the apples were damaged by the Chrysomelid, *Metachroma interruptum*, Lec.

CUTRIGHT (C. R.). **Paradichlorobenzene against the Black Peach Aphis**, *Anuraphis persicae-niger* Smith.—*Jl. Econ. Ent.*, xx, no. 2, pp. 250–253, 1 fig. Geneva, N.Y., April 1927.

Experiments in Ohio from 1923 to 1926 showed that paradichlorobenzene in  $\frac{1}{4}$  or  $\frac{1}{2}$  oz. doses is effective in controlling *Anuraphis persicae-niger*, Smith (black peach aphid) on the roots of young peach trees [*R.A.E.*, A, xiv, 71], without injuring the latter. In only one case was a tree found to be infested after treatment. The ant, *Lasius umbratus mixtus*, Nyl., var. *aphidicola*, Walsh, which attends the Aphids, is repelled by paradichlorobenzene. In spite of the control of the Aphid newly planted trees continued to die, the mortality being 33.4 per cent. for treated and 38.2 per cent. for untreated trees during the whole period, so that it is concluded that infestation by *A. persicae-niger* is not the cause of their death.

EYER (J. R.). **Tests of some recently developed Insecticides in Control of Grape Leafhopper and Oriental Fruit Moth**.—*Jl. Econ. Ent.*, xx, no. 2, pp. 253–261, 1 ref. Geneva, N.Y., April 1927.

Field tests were made in Pennsylvania with proprietary emulsions of pyrethrum soap, derris (derrisol) and coconut fatty acids (cocotine), and with nicotine, for the control of *Erythroneura* (*Typhlocyba*) *comes*, Say (grape leafhopper). Pyrethrum emulsion (6½ gals. to 100 gals. water) was as successful as 40 per cent. nicotine sulphate (1 pt. to 100 gals. water) in killing nymphs and preventing the hatching of eggs. Derrisol (1 pt. to 100 gals. water) also killed the nymphs but was not so effective as an ovicide. Cocotine (5½ lb. to 100 U.S. gals. water) proved less toxic, did not prevent hatching, and scorched the foliage unless combined with hydrated lime or Bordeaux mixture. In laboratory experiments orthotoluidine was found to be quite toxic to the nymphs, but it scorched the foliage and did not mix with Bordeaux; 10 lb. sodium fluosilicate with 10 lb. lime to 100 U.S. gals. water or Bordeaux mixture killed 100 per cent. of the nymphs, but caused some injury to foliage, although this was very slight with Bordeaux. The combination of the various materials with Bordeaux mixture did not appear to affect their toxicity to leafhopper nymphs. Bordeaux mixture used alone proved toxic in proportion to its strength, three times as many nymphs being killed at a strength of 12:12:100 as at 8:8:100.

Experiments with the same emulsions on twigs containing larvae of the second generation of *Cydia (Laspeyresia) molesta*, Busck (oriental fruit moth) did not result in any mortality. Nevertheless the younger larvae that left twigs sprayed with pyrethrum soap emulsion were so affected that they were unable to re-enter them or infest fresh ones. Further tests made in the laboratory with this material, using sprayed peaches and larvae of graded sizes, showed it to be very effective when combined with sodium fluosilicate and Bordeaux mixture or hydrated lime in preventing the larvae from entering the fruit. A dust of pyrethrum powder, hydrated lime and sodium fluosilicate (5:5:1) was also quite effective, as was also one of sodium fluosilicate and hydrated lime (1:10), while a spray containing 10 lb. sodium fluosilicate and 20 lb. hydrated lime to 100 U.S. gals. water killed the largest percentage of larvae (90.9). The dusts were slightly less effective than the liquids, and sodium fluosilicate was more directly toxic than pyrethrum, the larvae usually dying 48 hours after application even if they entered the fruit. Medium sized larvae (6-9 mm.) proved most resistant to all the materials used. In field tests sodium fluosilicate-lime dust and pyrethrum soap emulsion with Bordeaux mixture proved superior to nicotine and various forms of lead arsenate in reducing the number of infested fruit, the infestation being 47 and 50 per cent. respectively on trees to which they were applied, while on the control trees it was 75 per cent.

In the discussion that followed H. L. Dozier stated that the same form of pyrethrum soap spray had proved successful against *E. comes* and the apple leafhopper [*Empoasca fabae*, Harr.] [in Delaware] at a temperature of 100° F., the applications being a complete failure when the temperature dropped to 64° F. The author stated that the temperature was between 70 and 75° F. when the field applications were made against *E. comes* and *C. molesta*.

HAMILTON (C. C.). **The Relation of Leaf and Twig Growth of Two Varieties of Apples to the Quantity and Adherence of Lead Arsenate throughout the Spraying Season.**—*Jl. Econ. Ent.*, xx, no. 2, p. 261. Geneva, N.Y., April 1927.

This paper, of which only an abstract is given, is stated to record the results of weekly measurements made during the growing season of twig growth and leaf growth on marked twigs on apple trees correlated with analyses of the amount of lead arsenate on the foliage. Analyses made at the end of the season of lead arsenate on leaves from the marked twigs, separated into groups according to the dates when they first appeared, are correlated with the growth of the leaf area.

SAFRO (V. I.). **Adapting Fumigation Procedures to Industrial Needs.**—*Jl. Econ. Ent.*, xx, no. 2, pp. 261-267. Geneva, N.Y., April 1927.

The author discusses some basic principles of industrial fumigation, including the dosage range, air circulation during fumigation and penetration of the fumigant, with particular reference to the use of calcium cyanide. Dosages can generally be worked out for exposures ranging from the minimum quantity of fumigant to the minimum length of exposure, and the most practicable dose can then be chosen for any given case. Where the insect is buried in any medium, a dosage range

must be worked out for each type of commercial packing and for coarse or fine cereal products. Air circulation during fumigation ensures more efficient diffusion of the gas. Where calcium cyanide is used as the fumigant, air circulation ensures a more complete contact of atmospheric moisture with the particles, a more complete evolution of hydrocyanic acid gas, and a higher concentration in a shorter period of time. In the case of packed material sufficient time should be allowed for the retained gas to take its full effect; the time taken for the product to become free from gas depends on its density and humidity, the penetrability of the packing material, ventilation and other factors.

It is pointed out that a false impression has been created by the recording of the presence of hydrocyanic acid gas in foodstuffs after fumigation with calcium cyanide. The time that elapses before consumption and the handling of the foodstuffs in transportation and preparation should all be allowed for before an analysis with any practical significance can be made, and the presence of the gas in a product does not necessarily indicate that it is injurious to health. In the discussion that followed the author stated that after careful perusal of technical, commercial and popular literature, and correspondence with fumigators and investigators, no case of poisoning in man from fumigated food could be traced.

DRIGGERS (B. F.). **Calcium Cyanide as a Control for the Cranberry Root Worm on Cultivated Blueberries.**—*Jl. Econ. Ent.*, xx, no. 2, pp. 267-270, 4 refs. Geneva, N.Y., April 1927.

Preliminary laboratory and field tests with "light" and "extra light" sodium fluosilicate for the control of *Rhabdopterus picipes*, Ol. (cranberry root worm) were unsatisfactory, the material having little or no effect on the beetles. Though they show definite reactions when in contact with sodium fluosilicate, such as increased activity and also rubbing their legs together to try to free themselves of the dust, they were not observed cleaning their feet with their mouthparts, and this difference in habit from certain other beetles [*R.A.E.*, A, xiii, 118; xiv, 539] may possibly account for the results obtained.

In preliminary experiments with Cyanogas calcium cyanide "A" dust [*R.A.E.*, A, xiv, 74],  $\frac{1}{10}$  oz. was applied to each plant and lightly stirred into the soil. Though most of the beetles appeared to be dead after an hour, some recovered after 20 hours. The evolution of the gas from the fine dust particles was apparently so rapid that the beetles were not exposed to a lethal dose of gas for a sufficient length of time. Granular calcium cyanide [*R.A.E.*, A, xiv, 262] was applied in the same manner and in the same quantity, and all beetles were killed after an exposure of one hour.

In field tests on 10th July, each plant was treated with  $\frac{1}{2}$  oz. granular calcium cyanide applied over a circular area extending about a foot from it. The soil was immediately raked lightly toward the plant. The application was made about noon, when the air temperature was 32° C. [89-6° F.]. Three hours after the treatment, over 95 per cent. of the beetles were dead. No injury to the plants was noticed, and in further tests it was found that even  $2\frac{1}{2}$  oz. of the granular material caused practically no injury to the plants. Foliage in contact with or near the soil was slightly scorched with dosages of  $1\frac{1}{2}$  oz. and over, but such growth is mostly sucker growth which is removed by winter

pruning. The moisture content of the soil around the treated plants was 15.6 per cent., and the average soil temperature 28.4° C. [83.12° F.].

LEIBY (R. W.). "**Cold Steam**" **Spraying Machines**.— *Jl. Econ. Ent.*, xx, no. 2, pp. 281–284, 2 pls. Geneva, N.Y., April 1927.

In the machines described the spraying liquid is broken up into a fine mist by the velocity of steam. The fineness of the spray can be regulated by a valve that controls the amount of steam entering the nozzle near its aperture. Using approximately one part of water, as steam, to three parts of spraying liquid, the spray will be almost as fine as steam itself. In this case one steam nozzle does about 90 per cent. of the work of two high-pressure sprayer nozzles, in time consumed and area covered. The spray escapes with enough force to be carried a considerable distance. Both sides of the leaves are covered by the enveloping mist, which settles so gently that even the bloom in the calyx stage is not damaged. The temperature of the spray at 12 inches from the nozzle is slightly below that of the atmosphere. Field tests conducted over a period of two years, including dormant and summer sprays, have shown that insecticides and fungicides can be applied by the steam sprayer as effectively as with a high-pressure sprayer. As wastage by dripping can be controlled, from 30 to 40 per cent. of the spray material can be saved. It is possible to distribute uniformly a definite quantity of the basic insecticides of a given formula upon an acre of trees, in half the quantity of water or carrying liquid used by the pressure sprayer, but with equally good results.

The machine has also been adapted for field crops, but has so far only been used experimentally for spraying cotton. For the control of the cotton boll weevil [*Anthonomus grandis*, Boh.], it was found that 5 lb. calcium arsenate could be suspended in as little as 5 U.S. gals. water and applied uniformly over an acre of cotton.

Treating three rows at a time, an acre can be covered in 14 minutes. With a high pressure sprayer 100–150 U. S. gallons of spraying liquid would be required for an acre of an average row crop such as potatoes.

DOANE (R. W.). **The Genus *Ips* on the Stanford Campus**.— *Jl. Econ. Ent.*, xx, no. 2, pp. 284–286. Geneva, N.Y., April 1927.

In 1903 *Ips plastographus*, Lec., was the only representative of this genus to be found on the Stanford University Campus (California), and a number of trees of Monterey pine (*Pinus radiata*) were killed by it. Some years later the trees were also infested by *I. radiatae*, Hopk., which had become the predominant species by 1916. In 1921 a few specimens of *I. confusus*, Lec., were found in a small yellow pine [*P. ponderosa*] that had been planted near a wood yard in the vicinity. The next three winters were exceptionally dry, causing considerable weakening of the condition of the Monterey pines, which thus fell an easy prey to the bark-beetle. *I. confusus* spread rapidly and within two years was the predominant species. *I. plastographus* disappeared completely while *I. radiatae* was found in the lower part of some trees in the upper part of which *I. confusus* was working. A similar succession of species is apparently occurring in other parts of the San Francisco

Peninsula. None of these beetles appears to be able to enter a strong, healthy tree. When its power of resistance is lowered, the tree becomes a prey to the beetle that can tolerate the strongest sap flow; as this is diminished, other species may follow, and if there is enough cambium left for them to rear their young, they may survive. *I. radiatae* is apparently able to establish itself in a tree a little earlier than *I. plastographus*, while *I. confusus* is able to maintain itself in trees that would repel either of the other two species.

FRACKER (S. B.) & GRANOVSKY (A. A.). **The Control of the Hemlock Spanworm by Airplane Dusting.**—*Jl. Econ. Ent.*, xx, no. 2, pp. 287–294. Geneva, N.Y., April 1927.

This paper describes the campaign against *Ellopiia fiscellaria*, Gn., in Wisconsin [*R.A.E.*, A, xv, 294] carried out by means of aeroplanes, though a fuller account of the work will be published elsewhere. Hemlock [*Tsuga*] and balsam [*Abies balsamea*] were severely injured by the moth, and when these trees were defoliated, the larvae attacked others [*A*, xiv, 79]. It is estimated that the calcium arsenate dust, which was used undiluted, was applied at the rate of 20 lb. per acre. The area involved was 715 acres of forest and was extremely rugged, offering many difficulties and dangers.

COMPTON (C. C.) & FLINT (W. P.). **A Suggestion for Controlling the Locust Borer, *Cyrtene robiniae*.**—*Jl. Econ. Ent.*, xx, no. 2, pp. 295–298. Geneva, N.Y., April 1927.

The black locust tree [*Robinia pseudacacia*] is one of the most valuable native trees in the United States. Many plantations have been started in Illinois, but almost all have been destroyed by *Cyrtene robiniae*, Forst. (locust borer). Various methods of controlling this beetle have been tried with little success. Though under some conditions the beetles are attracted to poison baits, they are still able to lay eggs after feeding on them, while many lay a considerable number of eggs before feeding. Under experimental conditions most of the eggs were laid during the first 2–3 days and none after six days by beetles that had not fed. Banding the trees with various adhesive materials showed that the active beetles caught in the bands readily freed themselves of most of the adhesive. A 50 per cent. solution of sodium arsenite was found to unite well with the adhesive without impairing its sticking qualities. Lead arsenate and calcium arsenate did not mix well with the adhesive, and sodium fluoride, although mixing well, was too slow in its toxic action. The average life of the beetles in experimental cages was 15.1 hours when one part of the 50 per cent. sodium arsenite solution was used in 10 parts of adhesive, and 4.8 hours when the mixture was 1 : 5. With unpoisoned adhesive the average life of the beetles was 7.4 days as against 11.9 days where no adhesive was used. It was found in the field that very few beetles escaped when the poisoned band was placed around the tree about 5 ft. above the ground. Owing to the very short period of activity of the adults, very little work can be done in one year, so that further experiments are necessary before any definite recommendations can be made.

HOUSER (J. S.). *Ellopiä athasaria*, Wlk., a Looper attacking Hemlock.—*Jl. Econ. Ent.*, xx, no. 2, pp. 299–301. Geneva, N.Y., April 1927.

Considerable damage has been done to hemlock [*Tsuga*] by the Geometrid, *Ellopiä athasaria*, Wlk., in eastern Ohio. The larvae, which are described, begin feeding in the tops of the trees and gradually work downwards. The top of the tree dies first, and as defoliation continues, the lower branches succumb. One complete defoliation kills the tree. So far as is known, there is only one brood a year, the larvae reaching maturity about the middle of September. The winter is passed in the pupal stage among debris on the ground or in crevices at the base of the trees, dry situations being preferred. The outbreak of 1925 terminated as suddenly as it appeared. Where thousands of larvae occurred in 1925, only two were found in 1926. The fungus, *Sporotrichum globuliferum* was apparently responsible for the reduction of the pest, as the pupae were covered by the mycelium in the early spring. No parasites were reared.

WEBBER (R. T.). U.S. Bur. Ent. **Some Important Economic Insects of Central Europe**.—*Jl. Econ. Ent.*, xx, no. 2, pp. 301–310, 8 refs. Geneva, N.Y., April 1927.

Owing to the doubt apparently existing in certain quarters as to the necessity for the rigid restrictions enforced concerning the importation of plants into the United States, an account is given of various pests observed by the author in Central Europe in the course of investigations on *Porthetria dispar*, L. (gipsy moth). A brief account of the injury is given and in some cases the life-history is quoted.

The observations are limited to well-known pests. It is particularly difficult to secure accurate data on species of supposed less importance, and far too little is known of the actual history of many of these likely to be introduced into America for the risk of their establishment to be ignored.

DOHANIAN (S. M.). U.S. Bur. Ent. **Some of the Important Forest Insects of Western Europe**.—*Jl. Econ. Ent.*, xx, no. 2, pp. 310–316, 2 refs. Geneva, N.Y., April 1927.

The information in this paper was obtained during the author's visit to Western Europe and is presented in the hope that it may be found useful in combating these pests in the event of any of them gaining entry into America. Only some of the most serious and persistent pests are dealt with; they include pests of oak and pine. Of the former *Porthetria dispar*, L. (gipsy moth) is the most important all over Europe, except probably in Scandinavia; it is sometimes controlled by numerous natural enemies, but periodically occurs as a serious pest.

*Nygma phacorrhoca*, Don. (brown-tail moth) attacks both forest and fruit trees, its behaviour in Europe closely resembling that in America. In Spain it is more common in forests than on fruit trees, confining its damage to deciduous oaks and elms, and refusing to feed on evergreen oak. In Italy it feeds on forest and fruit trees and occurs in abundance even on horse chestnut (*Aesculus hippocastanum*). In the Rhine valley

for a distance of 25-30 miles, every fruit tree along the railway appeared to be covered with the webs of this pest in December 1925, but as a result of cleaning-up measures not one web was seen the following March.

*Malacosoma (Bombyx) neustria*, L., is generally found throughout Europe and is common as a pest of a great variety of trees in Western Europe. Of the oaks the deciduous varieties are preferred. The eggs are cemented on to small twigs in the form of a ring. The winter is passed in this stage, the eggs hatching about the middle of April and early in May. The larvae feed for about 2 months, and the adults appear in July. Five larval parasites and five egg-parasites have been recorded. Collection of the eggs and spraying the infested foliage with arsenicals is recommended; the latter measure has been successfully used in Spain in combination with spraying for *P. dispar* and *Tortrix viridana*, L. The last-named is a voracious feeder on the flowers and foliage of oak. There is one generation a year. The time of hatching of the overwintering eggs and the length of the larval period vary greatly in different parts of Europe; whereas in Spain and Italy the larvae feed only for about 4 weeks, in Portugal and England they feed continuously for about 10 weeks. The pupal stage usually lasts about 10 days, oviposition beginning a few days after the emergence of the adults. The eggs are laid singly or in groups of 2 or 3, but not in masses, near the buds and almost invariably on growth of the current season or that of the previous year. In consideration of this habit, an experiment has been made in Portugal to control the pest by cutting down and burning all such growth of *Quercus ilex*.

A number of important insects attack pines in western Europe, the principal pests being *Thaumetopoea (Cnethocampa) pityocampa*, Schiff., and the sawfly, *Diprion pini*, L. *T. pityocampa* occurs in practically all pine stands of Southern Europe and France. The eggs are laid about the middle of July and hatch about 4 weeks later. The larvae feed until late autumn and remain inside their web during the winter. In the spring they resume feeding until about the middle of May when they pupate in the soil at a depth of about 3-4 inches. The adults emerge in June or early July.

Although *D. pini* is said to prefer isolated pines or those in very open stands, it will readily attack trees in thick groves. The eggs are inserted singly in the needles of the preceding season; they hatch in 2-3 weeks, and the young larvae at once feed on the more tender needles. If the supply of these is insufficient, they will attack the two-year-old needles. Feeding continues for about 2 months, when the larva spins a cocoon attached to the bark. The adults emerge 2-3 weeks later. According to Prof. G. Cecconi, the full grown larvae of the second generation in Italy migrate to the soil, where they hibernate as larvae in the cocoons, pupation occurring early in March. *D. pullidus*, Klug, is also a serious pest.

SNYDER (T. E.). U.S. Bur. Ent. **Termites modify Building Codes.**—*Jl. Econ. Ent.*, xx, no. 2, pp. 316-321, 4 pls. Geneva, N.Y., April 1927.

This is an account of the injury caused to buildings by termites, 42 species of which occur in the United States. In Honolulu this damage amounts to a million dollars annually, while in New Orleans 80 per cent. of the frame buildings have been damaged and 50 per cent. of the

business buildings in Pasadena, California. A modified building code to prevent such damage on the west coast is recommended by the United States Bureau of Entomology [*R.A.E.*, A, xiii, 277; xv, 287]. The three principal points are insulation of untreated woodwork from the earth, metal termite shields to shut off the shelter tubes and treatment of interior woodwork and furniture with preservatives, the latter being essential only in the Gulf and Southwestern States, and southern California.

RUGGLES (A. G.) & WADLEY (F. M.). **The Green Bug in Minnesota.**—*Jl. Econ. Ent.*, xx, no. 2, pp. 321–327, 1 map. Geneva, N.Y., April 1927.

A serious outbreak of *Toxoptera graminum*, Rond., occurred in Minnesota during 1926 [*cf. R.A.E.*, A, xv, 2]. The wind records support the theory that the outbreak was due to migration from Oklahoma, where this Aphid is known to be able to pass the winter, which it cannot do in Minnesota. The greatest damage was done to oats, resulting in a loss of about 15 million bushels as compared with the average yield of previous years. The injury to wheat was much less, while barley and rye were not perceptibly injured even in the area of greatest abundance of the Aphid; development also takes place to some extent on blue grass and orchard grass.

At 70° F. the Aphid matures in about 8 days, at 60° F. in about 12, while below about 45° F. it does not develop at all. The summer temperatures in Minnesota seldom rise high enough to interfere even temporarily with its activities. No sexual forms were produced out of doors in the autumn.

Coccinellids were the most important natural enemies during the outbreak and developed in large numbers owing to the abundance of food, the species of importance being *Coccinella novemnotata*, Hbst., *C. transversogutta*, Fald., *Hippodamia convergens*, Guér., *H. tredecimpunctata*, L., and *H. parenthesis*, Say. Syrphids were next in importance. Hymenopterous parasites appeared late and were not abundant. In a greenhouse the Aphids were destroyed by a Cecidomyiid.

FENTON (F. A.) & DUNNAM (E. W.). U.S. Bur. Ent. **Winter Survival of the Cotton Boll Weevil at Florence, S.C.**—*Jl. Econ. Ent.*, xx, no. 2, pp. 327–336. Geneva, N.Y., April 1927.

Although the cotton boll weevil [*Anthonomus grandis*, Boh.] is a native of tropical America, it is able to pass the winter successfully in the northern edge of the cotton belt where the climate is extremely different. The results of several years' observations on the survival of the weevil in South Carolina are discussed.

The following is from the authors' abstract: From 1922 to 1926, an average of 3.27 per cent. of cotton boll weevils survived the winter in various types of protective shelters at Florence, South Carolina. Practically all weevils issuing from hibernation before cotton was available as a food-plant died, the average longevity at this time being 5.64 days. Of weevils emerging from winter quarters after cotton came up and placed in field cages on young cotton plants, a great majority died before these started to square, their average longevity under these conditions being 8.12 days. Weevils emerging at or after the time when squares were developed on cotton plants lived longer in

these same field cages than those emerging prior to this time, the average longevity for males being 16.28 days and for females 13.42 days. The maximum longevity at this time was 66 days for males and 46 for females. According to records on isolated trap plots of cotton near woods and field counts, weevils continued to enter cotton fields for 3 to 4 weeks after the first squares formed, or until about the time the first blooms appeared. In 1925, 90.01 per cent. of the surviving weevils had emerged in all cages at the time cotton began to square, 73.04 in those in the woods, 90.37 in those in the field, and 47.01 per cent. in the trap crops. That year emergence in the hibernation cages located in the woods corresponded very closely with that in the two trap crops after 14th May. In 1926, 98.03 per cent. of the weevils had emerged in all the hibernation cages when cotton began to square, all in those in the woods, 97.91 per cent. in those in the field, and none had been collected in the trap crops. The emergence of the weevils in the hibernation cages is called the "total emergence," and that in the trap crops the "effective emergence," since the latter represents those weevils that emerge late enough to find cotton. Trap crop records and field counts for the two years indicate that there may be a considerable migration of weevils to cotton fields after first square production, although this may actually represent a small percentage of the total survival for that year. The use of the trap crop in determining the rate of "effective emergence" of the weevil from hibernation is more reliable and more representative of field conditions than is that of the hibernation cage.

HUBER (L. L.) & NEISWANDER (C. R.). **The European Corn Borer and Ecological Habitats.**—*Jl. Econ. Ent.*, xx, no. 2, pp. 337-341, 1 map. Geneva, N.Y., April 1927.

The percentage of infestation by *Pyrausta nubilalis*, Hb. (European corn borer) in Ohio has been consistently high in certain areas and consistently low in others. Similar conditions are also recorded from certain regions in New York, Pennsylvania and Michigan. The annual records obtained along the border of Lake Erie since 1922 show a distinct tendency for accumulation at certain points; thus a narrow strip in north-eastern Ohio shows an average infestation of about 10,000 larvae to the acre while an area of equal width immediately south of this has not more than 400 to the acre. In north-western Ohio there is an even more marked contrast than this ratio of 25 to 1; and in certain places it is 45 to 1.

In the region at present infested with *P. nubilalis* the original forests, according to Dr. E. N. Transeau, consisted principally of three types: the oak-hickory forest, the beech-maple forest and the swamp forest. The oak-hickory forest generally occurs in drier areas; the beech-maple forest usually represents moister conditions both as regards atmosphere and soil; while the swamp forest, consisting of elm, ash, maple, swamp white oak [*Quercus platanooides*], pin oak [*Q. palustris*] and hickory, is typical of areas with a high soil water table and constantly humid conditions.

The more rapid accumulation of *P. nubilalis* has occurred rather uniformly in regions where the swamp forests are dominant and where beech-maple is the upland type. The accumulation is least rapid on the higher lands where the oak-hickory or beech-maple-pine are the dominant types. The heaviest infestation in Ohio occurs in an area

consisting largely of reclaimed swamp lands. As the survey is still incomplete, no definite conclusions can be drawn, but apparently the same factors that have determined the type of vegetation in restricted areas are also influencing the accumulation of *P. nubilalis*.

MCLAINE (L. S.) & CRAWFORD (H. G.). **The Status of the European Corn Borer in Canada (1926).**—*Jl. Econ. Ent.*, xx, no. 2, pp. 341–344. Geneva, N.Y., April 1927.

*Pyrausta nubilalis*, Hb., continues to spread into new territory in Canada; the entire maize growing districts of Ontario are infested, and the pest has now invaded Quebec. The infested area covers roughly 35,000 square miles. The most easterly infestation discovered during the past season is about 375 miles from the original outbreak. An isolated infestation has occurred about 250 miles north of the original infestation. With the exception of this northern outbreak the increase in the infested area is due to the natural spread of the insect.

Except in a small area where extensive educational and demonstration campaigns have been carried on and the percentage of infestation has been reduced by 10 per cent., there has been a decided increase in the amount of infestation. The area of complete loss estimated at about 400 sq. miles in 1925 has increased to about 1,200 sq. miles. In certain areas infestation has increased from 12 to 28 per cent. Apart from these areas of high infestation, the general infestation is so light that no serious damage was done in 1926.

Control operations are now being carried out in the eight most heavily infested counties in Ontario under the supervision of the provincial authorities.

NEISWANDER (C. R.) & HUBER (L. L.). **The European Corn Borer in Weeds and Truck Crops in Ohio.**—*Jl. Econ. Ent.*, xx, no. 2, pp. 344–351. Geneva, N.Y., April 1927.

Weeds and various vegetable crops, including radish, bean, potato, red beet, tomato and celery, are not known to be food-plants of *Pyrausta nubilalis*, Hb. (European corn borer) in Ohio at the present time, except in or adjacent to heavily infested fields of maize. The results of observations in experimental cages and in the field made in 1925 and 1926 indicate that several species, including the above, are potential food-plants should eggs be laid on them.

Certain maize fields with extensive weed growth showed as many as 2,293 borers to the acre in weeds alone. As neither eggs nor larvae younger than the third instar have been found on these plants in the field, it is assumed that the larvae had migrated from neighbouring maize.

HINDS (W. E.) & SPENCER (H.). **Airplane Dusting for Sugar-cane Borer Control in Louisiana.**—*Jl. Econ. Ent.*, xx, no. 2, pp. 352–359. Geneva, N.Y., April 1927.

*Diatraca saccharalis crambidoides*, Grote, causes an average damage of about 20 per cent. to the sugar-cane crop in Louisiana. Though

primarily a pest of sugar-cane, it also attacks maize, *Sorghum*, rice and various large-stemmed grasses. The eggs are laid in batches of up to 50 or more on either surface of the leaves and hatch in 5-9 days. They are heavily parasitised by *Trichogramma minutum*, Riley. The caterpillars make their way, as soon as possible after hatching, to the unexpanded leaves of the food-plant. They feed on this tender leaf tissue until, after the second moult, they are able to bore into the stalk. The injury shows as minute perforations arranged in a row across the blade of the leaf. The larvae are usually ready to bore into the stalk after about a week. The full grown larvae usually occur in a part of the stalk that is quite mature, and their work in this stage may extend into two joints. Pupation occurs in the burrow in a special cell, the adult emerging about a week later through an exit hole previously prepared by the larva.

Though the injury to sugar-cane may result in complete destruction of the crop, as was the case in a number of localities in 1925, this is uncommon. Such fields were not cut and must have sheltered large numbers of full grown larvae through the hibernation period. Owing to the difficulty in applying insecticides to full grown sugar-cane, dusting experiments by aeroplane have been made.

Calcium arsenate was used in 1925, but though an ideal distribution of dust was secured, the borers were not controlled. It was found that the larvae push the particles of calcium arsenate aside before feeding. A very limited test with sodium fluosilicate, however, gave surprisingly good results, and though the foliage was scorched this was not considered serious. Further tests with this material were made in 1926 with a hand dust-gun on maize, as the borers could be found more readily on this plant than on sugar-cane. In many of them from 55 to 75 per cent. of the larvae of all sizes were killed and from 5 to 9 per cent. of the pupae. Maize foliage is more susceptible to scorching than sugar-cane foliage and is a convenient index for comparing the effect of poisons. There appears to be only a small area of leaf per stalk that is in a horizontal position or sloping towards the stalk, but the structure of the leaf enables the dust, dew or rain to pass down the channel along the midrib to the stalk. This fact explains in a large degree the success obtained with sodium fluosilicate. The percentage of borers killed varies directly with the percentage of water-soluble fluorine in the material used. In normal sodium fluosilicate practically all the fluorine content (60 per cent.) is ultimately water-soluble, whereas in calcium fluosilicate only about 4 per cent. is water-soluble, so that the latter is less active and does not scorch the foliage or kill the borers. With sodium fluosilicate the solution passing down the leaf bathes the stalk of the plant and may even extend into the burrows of the borers so that they are killed without having come to the exterior to feed.

With a hand gun approximately 10 lb. sodium fluosilicate to the acre gave satisfactory control on maize, but in order to obtain the same percentage of control on sugar-cane, with material dusted from an aeroplane, from 15 to 20 lb. to the acre are required. The aeroplane usually passes about 10 or 15 ft. above the tops of the plants so that the dust cannot be aimed so directly at the plants as from a hand gun. The infestation in 1926 was unusually light so that only one application was made; it was reduced by about one-half in the stalks and by even more in the joints.

The first two generations develop more abundantly in maize than in sugar-cane, and many planters adopted the method of cutting out the

infested stalks and using them as green food. Over 90 per cent. of the borers could be removed by cutting only 10–20 per cent. of the maize stalks.

FRIEND (R. B.). **The Asiatic Beetle** (*Anomala orientalis*, Waterhouse).—*Jl. Econ. Ent.*, xx, no. 2, pp. 362–365. Geneva, N.Y., April 1927.

*Anomala orientalis*, Waterh., is found mainly in lawns. Its distribution in any one area varies, and as many as 1,000 to the square yard may occur in certain patches. The larvae feed on grass roots and dead organic matter close to the surface of the soil and in September may kill the grass. The adults feed on flowers in Connecticut, but it is possible that these are only attacked for the sake of moisture. The various stages, life-history, and habits of the beetle are described [*R.A.E.*, A, xiv, 410, 455]. The eggs are laid at a depth of 3–9 inches and were found in the field from 19th July to 10th September. The average incubation period is 28 days; in the insectary this varied from 10 to 41 days. An exposure to air-dry soil for 10 days is fatal to the eggs, but under natural conditions in New Haven the soil is never as dry as this. The winter is usually passed by the larva at a depth of 10–15 inches in the soil; it comes to the surface to feed about the end of April or beginning of May and continues feeding for about 6 weeks. About the middle of June it enters a prepupal stage at a depth of 3–9 inches below the surface. Seven days later it pupates, the adult emerging 15 days later. A considerable period of the adult life is spent in the ground.

BRITTON (W. E.). **Organization of a Co-operative Campaign against the Asiatic Beetle**.—*Jl. Econ. Ent.*, xx, no. 2, pp. 359–361. Geneva, N.Y., April 1927.

The injury to lawns by *Anomala orientalis*, Waterh. (Asiatic beetle) in New Haven, Connecticut, became so marked late in 1925 [*R.A.E.*, A, xiv, 455] that official control seemed warranted. A co-operative study of the insect was recommended as well as treatment of the soil to kill the grubs. Funds were obtained from Federal, State, City and private contributions, of which nearly £4,000 was spent. Quarantine regulations were enforced, and 19 tons of carbon bisulphide emulsion were used for treating the soil.

JOHNSON (J. P.). **Soil Treatment and Scouting for the Control of the Asiatic Beetle**.—*Jl. Econ. Ent.*, xx, no. 2, pp. 373–376. Geneva, N.Y., April 1927.

This is a brief account of the work against *Anomala orientalis*, Waterh. (Asiatic beetle) mentioned in the previous paper. Approximately 1,400 acres are now quarantined. The heavy infestation is concentrated on 300 acres; during the year 100 acres were treated with carbon bisulphide, applied at the rate of 3 U.S. pts. of liquid per sq. foot, using 1 qt. emulsion to 50 gals. water. This treatment is effective to a depth of nearly 3 inches, and if applied properly, destroys 98 per cent. of the grubs.

KING (J. L.), ALLEN (H. W.) & HALLOCK (H. C.). U.S. Bur. Ent. **The Present Status of the Work on the Parasites of *Popillia japonica*, Newman.**—*Jl. Econ. Ent.*, xx, no. 2, pp. 365–373. Geneva, N.Y., April 1927.

This paper deals with the progress of the parasite work at the Japanese Beetle Laboratory, New Jersey, from the autumn of 1924 to the autumn of 1926 and is the third of the series [*R.A.E.*, A, xii, 172; xiii, 338]. Further shipments of puparia of *Cnteter cinerea*, Ald., were received and divided into two lots, one of which was placed under the soil out of doors and the other in a cool cellar, during the winter. Out of door hibernation proved the better, giving an emergence of 71 per cent. This fly is now firmly established in the infested area, and its known distribution has increased to 60 square miles, extending into Pennsylvania.

Additional shipments of another Tachinid, *Ochremeigenia ormioides*, Town., have been received, and though attempts to recover this species at the points of liberation have so far failed, further colonisation is to be tried. Further liberations of *Prosenia siberita*, F., have been made, but although there are some favourable indications, the attempt to colonise this species has proved rather disappointing. The parasite, if present, occurs in such small numbers that it has been impossible to measure its presence quantitatively by any of the recovery work. This fly is a polyphagous one, widely distributed in eastern Asia, and there appears to be no reason why it should not become established in eastern North America. Various factors increase the difficulty of establishing this species, one of which is its pronounced tendency to disperse when liberated in the field. During 1926 it was found that the adults mate readily in large out of door cages covered with black mosquito netting. The first consignment of *Dexia ventralis*, Ald., was received in July 1925, consisting of 850 larvae of *Popillia japonica*, Newm., artificially infested with first stage larvae of the parasite. Adults emerged and gravid females were obtained, their larvae being allowed to parasitise *P. japonica*, but they failed to mature. In 1926 a consignment of 4,116 grubs of *P. japonica* containing second generation larvae of *Dexia* was received. They were placed in the soil for emergence after which 1,352 individuals were released in the field. Mating had occurred in captivity, and gravid females were found at the point of liberation. Larvae of *P. japonica* were artificially infested with first stage grubs from these females, and adults emerged from these in September. During the early autumn further consignments of grubs were received from which 176 adults emerged and were liberated.

Only adults of the Scoliid, *Tiphia popilliavora*, Roh., have been shipped during the past two years. Four separate colonisations of this species have been made within 4 miles of the laboratory. The parasite was recovered for the first time during 1926 and appears to be definitely established, though at present it occurs in rather limited numbers over a small area, on which a considerable number of parasitised larvae of *P. japonica* were recovered. The colony has very likely developed from a few females released in 1922.

Cocoons of *Tiphia vernalis*, Roh., were first received in August 1924, and 17 of the females bred were released in early May 1925. A second consignment of cocoons was received in the autumn of 1925; adults emerged in the spring and readily laid eggs on the larvae of *P. japonica* in confinement. The first shipment of adults of this parasite was made

in the spring of 1926 and has proved more promising than the shipments of cocoons. Two lots containing 2,790 field collected females were shipped from Korea, of which 411 reached the laboratory alive. They were used for propagation work, and 4,301 parasitised grubs were obtained and liberated. Each grub bearing an egg of the parasite was placed just under the surface of the soil, the material being scattered over several acres. In October the plot was examined, and cocoons containing larvae in excellent condition were found about 3 inches below the soil surface. *T. vernalis* readily attacks *Anomala orientalis*, Waterh., in captivity, and cocoons were obtained from this host.

Several undetermined species of *Tiphia* have also been imported. One of these shows promise of becoming established, and though only known as a parasite of *Anomala* sp. in Japan, it has been reared in large numbers in the insectary on *P. japonica* and was found attacking the larvae in the field. There are two generations a year in Japan, the adults of the second appearing in September, but in the insectary in New Jersey there has been no sign of a second generation, neither has it been seen at the point of liberation. This species has been shipped both as adults and cocoons; in the case of the latter the best results were obtained when they were placed in a cool cellar for hibernation, repacked in the early spring and kept under rather dry conditions until emergence.

A number of consignments of *Campsomeris annulata*, F., have been received. Laboratory experiments indicated that this Scoliid would occasionally oviposit on larvae of *P. japonica* but not readily.

Some of the problems connected with parasite introduction are briefly discussed. One of the important factors is the time spent en route. Even when the actual mortality is relatively low, a long journey is unfavourable to the parasite and greatly reduces its vitality. Shipments from Japan arrive in about 18 days, those from China in 22, while those from India have averaged approximately 60 days. The possibility of hybridisation and its probable effect on the ultimate success of the parasite must also be considered. The work so far has indicated that even among closely related forms each species possesses characteristics to which the method of procedure must be carefully adapted in order to increase the probability of successful establishment.

RICHMOND (E. A.). **A New Phototropic Apparatus.**—*Jl. Econ. Ent.*, xx, no. 2, pp. 376-382, 1 pl., 2 figs., 10 refs. Geneva, N.Y., April 1927.

The apparatus described is octagonal in shape, consisting of one central chamber and eight distinct outer compartments. It is so arranged that a different colour can be reflected in each compartment, and the beetles placed in the central chamber can enter any of these. In experiments with *Popillia japonica*, Newm., it was found advisable to separate the sexes and to keep the beetles in the dark for half an hour before testing their attraction to any colour. The results of the experiments are not yet ready for publication.

LEACH (B. R.) & LIPP (J. W.). **A Method of Grub-proofing Turf.**—*Jl. Econ. Ent.*, xx, no. 2, p. 383. Geneva, N.Y., April 1927.

Only the following abstract of this paper is published: The use of lead arsenate mixed with the soil to a depth of 3 to 4 inches before

seeding, or used in the top-dressing on turf already established is described [R.A.E., A, xiv, 530]. The method is proving satisfactory in practice. The large majority of fine turf grasses are stimulated in their growth by the presence of the poison on the soil.

In the discussion that followed, the senior author stated that he does not think the treatment prevents oviposition, as a large number of beetles [*Popillia japonica*] were seen entering the poisoned turf. Lead arsenate was used at the rate of 1,500 lb. an acre; after application about a third of the material loses its value, the remainder retaining its toxicity over a relatively long period. The action of the poison is only slightly diminished after 5 years.

Fox (H.). U.S. Bur. Ent. **The Present Range of the Japanese Beetle, *Popillia japonica*, Newm., in America and some Factors influencing its Spread.**—*Jl. Econ. Ent.*, xx, no. 2, pp. 383-391, 2 maps. Geneva, N.Y., April 1927.

Since its discovery in New Jersey in 1916, *Popillia japonica*, Newm., has steadily extended its range, which now includes parts of six States. In the present paper the area in which the beetle is of general occurrence is designated as its normal range, while the isolated infestations outside this range are called the area of discontinuity, the entire area being designated as the empiric range. Previous to 1923 the empiric range was very similar to if not identical with the normal range, but since then there has been a remarkable acceleration in the rate of spread, indicating the presence of some factor of dispersal not previously concerned. This factor is apparently mechanical transportation in freight cars, ships and other closed conveyances; it was in 1922 that the beetles first invaded the shipping centres of Camden and Philadelphia. In view of the introduction of this new means of dispersal, there has occurred since 1922 a progressively increasing discrepancy between the empiric and the normal range. The normal range has also increased, the greatest distance from the original infestation being 45 miles. The radius of this area varies from 21 to 45 miles, the furthest extension occurring eastwards. The progress has therefore been more rapid in New Jersey than in Pennsylvania. Wind and topographic features suggest themselves as possible explanations of this difference in the rate of spread. The prevailing winds during the activity of the beetles are west and south-west; these are also warm winds, which stimulate the beetle to increased activity and thus increase its chances of dispersal. Field observations indicate that the beetles usually fly with the wind provided that its mechanical action is not counteracted by more potent influences such as the chemotropic responses of the insect to certain odours given off by the vegetation. In New Jersey the northward and southward spread has been nearly if not quite as great as that towards the east; in this connection the concentration of the beetle near the limits of its normal range and the influence of a forest cover on the rate of spread must be taken into consideration. Available evidence indicates clearly that there is a greater tendency for the beetles to occur in large numbers at certain points close to the eastern limits of their range than at equally favourable localities close to the northern and southern limits. The interior of southern New Jersey forms a heavily wooded region known as the Pine Barrens, and though a forest does not form a very formidable barrier to *P. japonica*, it offers relatively few favourable feeding or

breeding areas and therefore has a retarding influence on the rate of advance, but in the Coastal Plain of New Jersey, to which the normal range of the beetle in that State has until recently been entirely confined, the conditions are those most favourable to its spread [*R.A.E.*, A, xiv, 428]. In the westward extension of its range through Pennsylvania the beetle has been forced to adapt itself to stiff, heavy clay and loam soils, often of little depth, especially on the steeper slopes, and frequently quite stony. Although present knowledge indicates that the direction of prevailing wind and the topography are the factors most likely to influence the natural spread of *P. japonica*, the validity of the suggestions must be tested by future investigation.

STAHL (C. F.). **A Preliminary Report on a Grass-root Mealybug** (*Ripersia radiculicola*, Morrison) affecting Sugar Cane in Cuba.—*Jl. Econ. Ent.*, xx, no. 2, pp. 392-399, 1 pl., 1 fig., 7 refs. Geneva, N.Y., April 1927.

*Ripersia radiculicola*, Morrison (grass-root mealybug) is widely distributed in Cuba, where it occurs on the roots of grasses and sugar-cane. A list is given of its food-plants, which include maize (*Zea mays*) and *Sorghum* spp. It is apparently primarily a pest of grasses, and is probably native in Cuba or has at least been present for a long time. Owing to the changes in cultural conditions resulting from the rapid extension of sugar-cane plantation, it now attacks the roots of this crop. Most of the grasses attacked are annuals; the mealybug has not been found on such grasses as *Panicum barbinode* and *P. maximum*, even when growing in infested areas. The injury to sugar-cane may be severe in areas of light soil; in time of drought many of the plants may be killed, and under such conditions it is almost impossible to obtain a new stand of sugar-cane. Grasses grow up in the areas where the sugar-cane has been killed, thus perpetuating and increasing the infestation. It is difficult to replant sugar-cane in such areas unless the conditions favouring the development of the mealybug are changed. Sugar-cane growing under favourable conditions may be heavily infested with *R. radiculicola* without showing any visible effect of the attack. In common with other mealybugs this species is always attended and protected by ants, the most common of which is *Tapinoma melanocephalum*, F. The nests of this ant have been found at the base of the infested plants, and it is very probable that it is largely responsible for the spread of *R. radiculicola*. In view of this and of the presence of its many grass food-plants, soil fumigation does not seem likely to be a practical method of control, at least until a more careful study has been made of all the factors concerned. The possibility of using certain legumes as cover crops for improving soil conditions and suppressing the grasses has been considered and is now being tried.

HAMLIN (J. C.) & REED (W. D.). U.S. Bur. Ent. **Insect Revival after Fumigation**.—*Jl. Econ. Ent.*, xx, no. 2, pp. 400-428, 8 refs. Geneva, N.Y., April 1927.

A brief summary is given of the literature in which mention is made of the possibility of revival in treated insects and the time elapsing between fumigation and determination of results. In the authors' experiments adults of *Silvanus* (*Oryzaephilus*) *surinamensis*, L. (saw-toothed grain beetle) and larvae of *Plodia interpunctella*, Hb. (Indian

meal moth) were fumigated with carbon bisulphide in railway cars, packing plants and other chambers. In two cases carbon dioxide was used in conjunction with carbon bisulphide. The object of the experiments was to ascertain to what extent the insects revived after fumigation. The results clearly indicate that the effect of fumigation cannot be judged as a result of examination within 24 hours of treatment. In the case of *S. surinamensis* revivals occurred daily until the tenth day after fumigation, and in the case of *P. interpunctella* up to the fifteenth day. There is a distinct association between revival and moderately low temperatures. In both cases two groups of experiments were made, one under outside temperatures of 78° F. or lower and the other at 81° F. or above. In the case of *S. surinamensis* the lower temperatures show a constant excess of revivals over subsequent deaths, the totals being approximately at the rate of 2 to 1. The lower temperature group in the experiments with *P. interpunctella* shows the same general conditions, except that in this case the revival period is much longer. In one experiment, however, during which the maximum temperature was 60° F., both species were killed outright, no revivals occurring. The experiment was made in a chamber of exceptional tightness; thus when leakage was almost eliminated, no insects revived in spite of the suitability of the temperature for revival. This result indicates that, although moderately low temperature is the primary condition favouring revival, some imperfection of fumigation, such as inadequate dosage or exposure, variation in the quality of the material used, leakage, etc., must contribute to the production of the revival phenomenon in the case of temperatures above 60° F.

It is pointed out that extended examination of lots of insects from the treated material is necessary to determine the effectiveness of fumigation operations with carbon bisulphide. In general the percentage of mortality is apt to fluctuate after a brief interval following fumigation. In several experiments more living individuals were found at the final counts than at the examination 24 hours after treatment, and some of the larvae of *P. interpunctella* that revived ultimately produced adults.

The proper interval for checking results after fumigation apparently varies with different species and conditions of fumigation; it therefore seems impracticable to establish any arbitrary interval which would constantly provide a correct expression of effectiveness. Several examinations must be made; the final count is not a fair indication of the mortality obtained, as it reflects the probable death of some of the individuals as a result of adverse conditions in confinement during the protracted examination. The maximum revival or minimum mortality appears to be the most satisfactory index of effectiveness.

HOOD (C. E.). U.S. Bur. Ent. **The Quantity of Fish Oil to use as an Adhesive in Lead Arsenate Mixtures.**—*Jl. Econ. Ent.*, xx, no. 2, p. 428. Geneva, N.Y., April 1927.

Further experiments with fish oil as an adhesive for lead arsenate sprays [*R.A.E.*, A, xv, 289] have shown that the amount of fish oil used should depend on the amount of lead arsenate, and that 3 qts. are sufficient for 25 lb. of powdered lead arsenate. This amount should be increased or reduced at the rate of 4 oz. by weight to every pound of powdered lead arsenate, regardless of the amount of water used. This does not apply to mixtures containing Bordeaux.

SIEGLER (E. H.) & BROWN (L.). U.S. Bur. Ent. **Can Baits be used in Scouting for Injurious Insects?**—*Jl. Econ. Ent.*, xx, no. 2, pp. 428–429. Geneva, N.Y., April 1927.

Baits consisting of syrups diluted with water and evaporated fruits suspended in water were used in apple and peach orchards in Maryland for capturing *Cydia* (*Carpocapsa*) *pomonella*, L. (codling moth) and *C. (Laspeyresia) molesta*, Busck (oriental fruit moth). In two peach orchards over 19,000 moths of the latter species were captured, and in an apple orchard 17 individuals were taken and 13 of *C. pomonella*. It is suggested that the chemotropic reactions of insects might be made use of in scouting work and that further experience may prove the attraction of baits to be of greater value in such work than in insect control.

WOLCOTT (G. N.). **Common Insect Pests prefer other Host Plants in Haiti.**—*Jl. Econ. Ent.*, xx, no. 2, pp. 429–430. Geneva, N.Y., April 1927.

*Systema basalis*, Duv. (American flea-beetle) is recorded from Haiti as a pest of cotton. Although tobacco, its most usual food-plant in Porto Rico, occurred in abundance near the cotton, no beetles could be found on it.

*Nezara viridula*, L. (pumpkin bug) occurs mainly on cotton in the Lesser Antilles and on garden vegetables, particularly tomatoes and peppers, in the Greater Antilles. In 1921 it was recorded from Porto Rico as causing considerable damage to tobacco and in January 1927 the author found it on this food-plant in Haiti; the results of feeding by the adults and large nymphs were seen throughout one field, and the pest was far too common in the district for its presence on tobacco to be considered accidental.

RUDOLFS (W.). **Increasing Nicotine Evolution from Tobacco Dust.**—*Jl. Econ. Ent.*, xx, no. 2, pp. 430–431. Geneva, N.Y., April 1927.

The slow volatilisation of nicotine is one of the disadvantages in the use of tobacco dust for the control of insect pests. A series of laboratory experiments was made in 1924 and 1925 to determine the effect of mixing tobacco dust with several activators on the evolution of nicotine [*cf. R.A.E.*, A, xii, 31; xiii, 386]. The results are summarised, and the technique employed is briefly described. Tobacco dust alone, when dry, evolved more nicotine than when mixed with any one activator tried, and alone or mixed with an equal weight of Milltown ball clay released less nicotine moistened than dry. Nicotine evolution increased considerably when mixtures of tobacco dust and lime or dolomite (50 : 50 by weight) were moistened, and the addition of small quantities of sodium carbonate (1–5 per cent. by weight) to these mixtures practically doubled the amount of nicotine evolved. The nicotine in the tobacco dust is driven off by the alkali; when the mixture is moistened, the alkali penetrates better into the tobacco. Possibly the acidity of Milltown ball clay has the effect of retaining part of the nicotine evolved from the tobacco.

MCGREGOR (E. A.) & NEWCOMER (E. J.). **The True Identity of the Citrus Mite.**—*Jl. Econ. Ent.*, xx, no. 2, p. 429. Geneva, N.Y., April 1927.

As a result of extensive investigations, which will be published in detail elsewhere, the authors have come to the conclusion that *Paratetranychus citri*, McG. (citrus mite) is distinct from *P. pilosus*, C. & F. (European red mite).

DOUCETTE (C. F.). U.S. Bur. Ent. **The Tulip or Iris Aphid in Santa Cruz County, California.**—*Jl. Econ. Ent.*, xx, no. 2, pp. 431-432. Geneva, N.Y., April 1927.

*Anuraphis tulipae*, Boy., causes considerable damage to bulbs and rhizomes of various species of *Iris* in storage in California. The damage was less severe in 1925 than in 1924, probably owing to fumigation. During 1926 almost all warehouses were again infested. About 500 infested bulbs were kept during the summer in the laboratory. Winged individuals occurred from 10th September to 15th October, issuing from both shrivelled and plump bulbs.

During the fumigation work in 1924, from 8 to 16 oz. of calcium cyanide per 100 cu. ft. was used with an exposure of 2 hours. The calcium cyanide was spread on burlap sacks soaked in water, so that full evolution of the hydrocyanic acid gas was not obtained, but the results were satisfactory. In 1926 experiments were made with granular calcium cyanide applied at the rate of 1.76 and 2.35 oz. per 100 cu. ft. Damp, but not wet, sacks were placed on the floor of the fumigating chamber and covered with 3-4 thicknesses of dry newspaper on which the material was spread thinly. The exposure lasted 2 hours. There was no evidence of injury to the bulbs as a result of the treatment. It is possible that the amount of calcium cyanide could be reduced by extending the exposure, but the increase in cost of labour would counterbalance the value of the material saved.

CAESAR (L.) & MARSHALL (J.). **Lubricating Oil Emulsion Sprays.**—*Canad. Hortic.*, 1, no. 5, p. 126. Peterboro, Ont., May 1927.

An account is given of lubricating oil sprays as used against Coccids, leaf-rollers, etc., with instructions on the choice of suitable oils, the mixing of an emulsion, method of dilution, and precautions to be observed in their use.

FULLAWAY (D. T.). **Report of the Entomologist, January 1925—December 1926.**—*Hawaii: Rept. Bd. Agric. & Forestry, 1925-1926*, pp. 39-46. Honolulu, 1927.

The insect enemies of *Adoretus sinicus* (Japanese beetle) introduced from Formosa into Hawaii have included a Tachinid [*Ocromeigenia ormioides*], a Scoliid [*Tiphia* sp.] [*R.A.E.*, A, xv, 98], and a Carabid predator. None of these has as yet been recovered. In addition to *Anagyrus dactylopii* [*R.A.E.*, A, xiv, 500], a Coccinellid, *Scymnus* sp., has also been introduced against *Pseudococcus filamentosus* and liberated, but its establishment has not yet been ascertained. The enemies of the avocado mealybug [*Pseudococcus nipae*], recently introduced [*R.A.E.*, A, xiv, 179], are extending their range and appear to be giving entirely satisfactory control; those introduced against the pineapple mealybug

[*P. brevipes*] have not done so well and require further study. Besides the Chalcid, *Euplectrus platyhyphenae*, and the Tachinid, *Archytas cirphis*, introduced against army worms, the Ichneumonid, *Hyposoter exiguae*, and the Scelionid, *Telenomus nawai*, (the latter being a very valuable egg-parasite) have reached the Islands by natural means and are important factors in control. Two Tortricids, *Amorbia emigratella*, which has a leaf-rolling larva that attacks the tender foliage of the nut tree, *Macadamia [ternifolia]*, and checks or prevents normal growth, and *Cryptophlebia (Argyroplote) illepidia*, which bores in the larval stage in the fruit of litchee, seeds of koa [*Acacia koa*], *Macadamia* nuts, etc., are difficult to control by artificial means, and their natural enemies are being sought in Mexico and the Orient respectively. The depredations of the termites, *Coptotermes formosanus* and *Cryptotermes piceatus*, are increasing as their communities become more populous and widespread.

The insects introduced into Hawaii to destroy *Lantana* have failed to hold this plant in check. Though they render the work of controlling this weed much lighter than was formerly the case, they are not sufficiently effective to prevent the plant from slowly spreading. *Lantana* grown on the west coast of Mexico is being investigated for further enemies. A Tortricid, *Bactra truculenta*, one of the enemies of nut grass introduced from the Philippine Islands, has become established, and a weevil, *Apion* sp., an enemy of gorse (*Ulex europaeus*), has been introduced from England. A recent natural immigrant is the weevil, *Listroderes apicalis*.

WHITNEY (L. A.). [Report of the] Division of Plant Inspection, January 1925-December 1926.—*Hawaii: Rept. Bd. Agric. & Forestry, 1925-1926*, pp. 48-57. Honolulu, 1927.

The pests intercepted include: from California, the termite, *Reticulitermes hesperus* on *Citrus* fruits, *Pseudococcus maritimus* on apples and pears, *P. gahani* on peaches, persimmons and ornamental plants, *Chrysobothris femorata* in deciduous fruit trees, and *Phorbia planipalpis* on radishes; from Japan, *Aiolomorphus rhopaloides* (bamboo tip wasp) in bamboo brooms made from a species of *Phyllostachys*; from Mexico, the larva of *Cydia (Carpocapsa) saltitans* in seeds of *Euphorbia*; and from the Philippines, *Cosmopolites sordidus* on abaca plants (*Musa textilis*).

Poos (K. W.). U. S. Bur. Ent. **Biology of the European Corn Borer (*Pyrausta nubilalis*, Hübner) and two closely related Species in Northern Ohio.**—*Ohio Jl. Sci.*, xxvii, no. 2, pp. 47-88, 6 pls., 3 figs., 10 refs. Columbus, Ohio, March 1927.

At the beginning of 1926, the area infested by *Pyrausta nubilalis*, Hb., in Ohio totalled 8,529 square miles, and that in Michigan 6,232 square miles. *P. ainsliei*, Heinr., found on smartweed [*Polygonum*], and *P. penitalis*, Grote, on lotus and smartweed also occur and are frequently confused with *P. nubilalis*. All these moths pass the winter as full-grown larvae, *P. nubilalis* having only one generation in a year, while *P. ainsliei* has a partial second generation and *P. penitalis* three full generations. The life-history and seasonal occurrence of *P. nubilalis* is recorded in full, and slight variations between this and the other species in question are discussed. Winter mortality is not an

important factor in control, but a large percentage of the young larvae failed to complete their development. Experiments with different varieties of maize did not reveal any kind possessing appreciable immunity from *P. nubilalis*, but maize planted on the optimum (or earlier) dates of planting contained on the average higher infestation than that planted after 1st June. Preliminary experiments in disking and ploughing as accessory measures in control of *P. nubilalis* indicated that these methods are unsatisfactory in practice; in Ontario, however, ploughing in stubble and refuse has been found effective [R.A.E., A, xi, 498; xii, 178], and if similar conditions should arise in Ohio, it is hoped that equally successful results would be obtained there also.

*P. nubilalis* is rarely attacked by native parasites in Ohio. Three species were observed during 1922-1925, while ten species attacked *P. penitalis* and four parasitised *P. ainsliei*. Some hyperparasites were also reared. Parasites are undoubtedly an important factor in controlling *P. penitalis* and *P. ainsliei*, and owing to the close affinity of these species with *P. nubilalis*, their possible aid in the control of the latter should not be overlooked.

WORTHLEY (L. H.) & CAFFREY (D. J.). **Spread and Infestation by the European Corn Borer during 1926.**—U.S. Dept. Agric., Misc. Circ. 104, 11 pp., 2 figs. Washington, D.C., April 1927.

This circular discusses the present situation with regard to *Pyrausta nubilalis*, Hb. (European corn borer) and recommends measures for the spring campaign, particularly for those areas where the spread of the borer is expected. The importance of scouting and quarantine operations is pointed out, and this phase of the work is briefly reviewed. In the middle western areas the borer increased alarmingly in 1926, and tables recording the results of survey work show by how much infestation has increased in various States. In the western New York area, infestation since 1921 has increased by about 17 times, counting the number of borers per ear. In the New England area, however, the number of borers has decreased by 94 per cent. since 1922. The importance of the proper treatment and disposal of maize stubble is again emphasised, and a stubble pulveriser is illustrated that can be employed to destroy stubble not more than 14 in. high. The stubble from the crop of 1926 has been found to be badly infested, and unless the number of borers left in the maize is greatly reduced a marked increase in infestation will occur in 1927. Weeds in the middle western areas are largely infested with *P. nubilalis* and play an important part in the carrying over of infestation. Large-stemmed weeds or grasses when growing near infested maize fields should be dealt with in the cleaning-up operations. Field experiments have shown that the adult moths can fly at least 20 miles, and wind undoubtedly adds largely to this distance. Moths emerging from stored maize-stalks and ovipositing on growing maize produced larvae that developed as readily as those from eggs deposited earlier in the season; the necessity for destroying such maize stalks is therefore obvious. Larvae hatching from eggs deposited on late-planted maize will reach full growth in time to establish themselves on maize plants. Husking machines fitted with shredder heads, cutter heads, or a combination of both showed that these methods of treating infested fodder were very effective in killing borers. Where sufficient tension was maintained an

average of 98 per cent. of borers was killed. Silage cutters that cut infested stalks into lengths of  $\frac{3}{8}$ ,  $\frac{5}{8}$ , and  $\frac{3}{4}$  in. killed all the borers in the stalks.

A brief statement is made as to the work that has been done up to the end of October 1926 on the importation of European parasites of this moth.

DRAKE (C. J.) & HARRIS (H. M.). **Three New Species of Enicocephalidae.**—*Ohio Jl. Sci.*, xxvii, no. 2, pp. 102–103. Columbus, Ohio, March 1927.

Among the new Henicocephalid bugs here described is *Systelloderus iowensis*, two individuals of which were found in a cage feeding on emerging adults of *Mayetiola destructor*, Say (Hessian fly) in Iowa.

COOLEY (R. A.). **Montana Insect Pests for 1925 and 1926, being the Twenty-first Report of the State Entomologist of Montana.**—*Montana Agric. Expt. Sta.*, Bull. 200, 26 pp., 2 maps. Bozeman, Mta., January 1927. [Recd. May 1927.]

*Anabrus simplex*, Hald. (mormon cricket) has been gradually becoming more abundant and injurious in western Montana for some years, and in 1926 the situation was so alarming that some farmers left the country on account of it and many plantings were abandoned. The damage during 1926 is estimated at about £24,000, some 250,000 acres being infested.

*Eutettix tenella*, Baker (sugar-beet leaf-hopper) is undoubtedly the most serious insect pest of sugar-beet and has caused such heavy losses, amounting at times to millions of pounds sterling, in the western States, that some of the sugar-beet factories have been closed. During the last two years the possibility of establishing the industry in Montana has been considered, and a few new factories are being set up there. *E. tenella* is present in the State, but not in any numbers, and it is considered probable that a profitable sugar-beet industry can be established. Further studies will be made of the insect to determine whether breeding conditions are favourable in Montana and whether it can survive the winters.

A list of the insects occurring during 1925 and 1926 is contributed by W. B. Mabey; they are listed under their popular and scientific names and classified under the names of the crops they attack. No unusual pest was recorded, but *Otiorrhynchus ovatus*, L. (strawberry root weevil), which is the most important pest of strawberries, has also been reported during the past season as damaging raspberries. A number of insects are recorded as beneficial in destroying weeds; among them *Pyrameis* (*Vanessa*) *cardui*, L., was of considerable value in destroying thistles, particularly among growing crops.

The State Entomologist Law, setting forth the duties and status of the Entomologist of Montana, is quoted, and the text of the County Insect Pest Law, as applicable to the county commissioners of the State, is given.

MENZEL (R.). **Parasieten van thee- en kina-insecten.** [Parasites of Insects on Tea and Cinchona.]—*De Thee*, vi, no. 4, pp. 115–122. Buitenzorg, December 1925. [Recd. June 1927.]

Among the parasites of cinchona pests, the Chalcid, *Anastatus* sp., an egg-parasite of the Saturniid, *Attacus atlas*, L. [R.A.E., A, xiv,

520] occurs in Java and Sumatra. It appears to be a native species, and in one observation up to 80 per cent. of the eggs were parasitised. A Proctotrupid egg-parasite, *Neotelenomus* (*Telenomus*) *abnormis*, Crawf., attacks the Lymantriid, *Euproctis flexuosa*, Sn. The Tachinids, *Compsilura concinnata*, Mg., and *Tricholyga sorbillans*, Wied., parasitise the larvae of the Lasiocampid, *Metanastria [hyrtaca, Cr.]* [A, xii, 109; xiii, 224]. No less than 1,360 eggs were found in a batch of about 80 caterpillars. Infested larvae may pupate, but no adult emerges.

Among the parasites of tea pests, *T. sorbillans* is occasionally so effective a parasite of the bunch caterpillar, *Andraca bipunctata*, Wlk., that direct measures against it are unnecessary. Another Tachinid, *Chaetexorista javana*, Br. & Berg., is a very efficient check on the Limacodid, *Setora nitens*, Wlk., which is also kept down by a Braconid, *Spinaria armator*, F. [A, xii, 293]. Other Braconids, *Apanteles homonae*, Rohw., and *Microbracon leefmansii*, Rohw., parasitise leaf-rolling caterpillars [*Homona coffearia*, Nietn., and *Gracilaria theivora*, Wlsm., respectively], but at present it is not known whether their liberation is likely to be of value. The Proctotrupid, *Telenomus latisulcus*, Crawf., is an egg-parasite of the tea seed bug, *Poecilocoris [hardwicki, Westw.]*. *Helopeltis antonii*, Sign., is parasitised by Mermithids [A, xiv, 144, 558] and by the Braconid, *Euphorus helopeltidis*, Ferr. [A, xiv, 202, 558; xv, 53].

STELLWAAG (—) & GEISSLER (—). **Eine neue praktische Arbeitsmethode mit Blausäure, die bei der Bekämpfung des Apfelblütenstechers (*Anthonomus pomorum*, L.) angewandt wurde.** [A New Practical Method of using Hydrocyanic Acid Gas that has been employed against the Apple Blossom Weevil.]—*Anz. Schädlingssk.*, iii, no. 6, pp. 63–67. Berlin, 15th June 1927.

*Anthonomus pomorum*, L., hibernates almost exclusively in the bark of old apple trees, and this fact has suggested the winter use of hydrocyanic acid gas against it. Experimentally all individuals were killed by exposure for five minutes to air containing five volumes per cent. of the gas. In further experiments the bark was well wetted with the solution of sodium cyanide, sprayed from the ground upwards to prevent drip. When this liquid had penetrated the bark, a solution of hydrochloric acid was applied, causing an instantaneous generation of hydrocyanic acid gas. On the following day dead weevils were found on the trees.

It is important that the strengths of the solutions be such as to result in a neutralisation on and in the bark, leaving only a residue of sodium chloride (common salt) that is unlikely to be harmful to the tree. A 20 per cent. solution of sodium cyanide is the best, and for neutralisation (which is never complete in practice) it is necessary to use about two cubic centimetres of crude 32 per cent. hydrochloric acid solution to every gram of solid sodium cyanide.

PFEFFER (A.). ***Dermestes lardarius* als Schädling der Holzbauten.** [*D. lardarius* as a Pest of Constructional Timber.]—*Anz. Schädlingssk.*, iii, no. 6, pp. 67–69, 5 figs. Berlin, 15th June 1927.

The infestation of wood by the bacon beetle, *Dermestes lardarius*, L., has been repeatedly recorded, though no explanation of this has been forthcoming. The forestry institute at Prague has investigated the occurrence of *D. lardarius* in the soft spruce wood framing of

a sheet zinc breeding box. It was found that the larvae bored into the wood in order to find a place for pupation only [cf. *R.A.E.*, A, x, 579]. This beetle is therefore only an accidental pest of timber, but as infestation by it may prove very serious, it is desirable to find some substance with which timber likely to be attacked may be impregnated.

**Ein Briefwechsel über den Kaffeebeerenkäfer.** [Correspondence on the Coffee Berry Beetle.]—*Anz. Schädlingssk.*, iii, no. 6, pp. 69–74. Berlin, 15th June, 1927.

In the course of this correspondence Dr. A. Neiva, chief of the Coffee Defence Service in S. Paulo, gives an account of the successful campaign in that State against the coffee berry borer, *Stephanoderes hampei*, Ferr. After the presence of this Scolytid and the severity of the damage it did had been ascertained, the coffee planters followed a policy of concealment until the government assumed the supervision of the measures and rendered them compulsory [*R.A.E.*, A, xiii, 346]. Control of the movement of coffee prevented its despatch by planters who had not carried out the prescribed measures. One of the most important of these included complete picking of the berries on the bush and on the ground, and burning all debris or burying it 12 inches deep. This is facilitated by the fact that 70–80 per cent. of the crop ripens at one time. The harvested berries are bagged and fumigated with carbon bisulphide [A, xiii, 232] and are then washed and dried in the sun as usual. Empty coffee bags are fumigated before return to the plantations [A, xiv, 178]. Labourers and their effects are examined when they enrol at a plantation, because the coffee carried by them for personal use has proved an important factor in the dissemination of the pest. The Brazilian custom of abandoning unremunerative plantations has built up reservoirs of infestation, and the destruction of all abandoned bushes is now carried out, over a million and a quarter having been destroyed at the time of writing. The rise in price of carbon bisulphide consequent on the increased demand was dealt with by establishing a government factory in competition with the commercial ones.

It will never be possible to eradicate the borer, but it has been reduced to a negligible quantity. Biological control is not regarded as promising in Brazil, and no parasite has as yet been found there.

In his reply, Dr. K. Friederichs, who was for some years entomologist of the Coffee Berry Borer Fund in the Dutch East Indies, compares the situation there with that in Brazil. The success of the Brazilian measures is due partly to their drastic severity based on government authority and partly to the climate being unfavourable to the pest [A, xii, 484]; the long interval between the crops enables cleaning up to be very effective, whereas in the Dutch East Indies berries are ripening all the year round in some regions.

DE AZEVEDO MARQUES (L. A.). **Pragas do algodoeiro. iv. (Lagarta rosea dos capulhos.)** [Cotton Pests. iv. The Pink Bollworm.]—*Bol. Minist. Agric. Ind. e Comm.*, xvi (i), no. 4, pp. 502–512, 2 figs. Rio de Janeiro, April 1927.

This article describes methods of fumigating cottonseed with carbon bisulphide and hydrocyanic acid gas against *Platyedra gossypiella*, Saund., which is now a serious pest of cotton in the north-eastern part of Brazil.

LOPEZ DOMINGUEZ (F. A.). **Informe anual del director de la estación experimental insular, Río Piedras, 1925-26.**—62 pp. San Juan, P.R., 1927.

Insecticides have proved useless against the cane-grubs attacking sugar-cane in Porto Rico, carbon bisulphide, which gave satisfactory results [*R.A.E.*, A, xv, 152,], being too costly. The introduction of parasites is suggested, and mention is made of the work done on behalf of the Central Aguirre Sugar Company for this purpose [A, xv, 412, etc.]. Toads [*Bufo marinus*], imported from Jamaica against the grubs, failed to breed in captivity and were liberated. A small white caterpillar found boring into the ends of tender roots of sugar-cane was identified as *Sufetula grumalis*, Schaus. The banana weevil, *Cosmopolites sordidus*, Germ., has continued to spread. A fly, *Euxesta notata*, Wied., occurs in oranges previously injured by some other agency. Experiments with the fruit-fly, *Anastrepha fraterculus*, Wied., the larvae of which occur in *Spondias mombin*, showed that neither the eggs nor the larvae develop in *Citrus*. This fly is a serious pest of *Citrus* in Argentina, but has not been observed attacking it in Porto Rico. Experiments are being made to find varieties of sweet potato resistant to *Cylas formicarius*, F.

HAYES (W. P.). **Prairie Insects.**—*Ecology*, viii, no. 2, pp. 238-250, 2 figs., 24 refs. Brooklyn, N.Y., April 1927.

This paper deals with the ecology of prairie insects, with special reference to the region in the vicinity of Riley County, Kansas.

COOK (W. C.). **Studies in the Ecology of Montana Cutworms (Phalaenidae).**—*Ecology*, viii, no. 2, pp. 158-173, 1 map, 1 graph, 1 ref. Brooklyn, N.Y., April 1927.

This paper deals with the geographical and seasonal relations of cutworms and their local distribution as affected by cultivation on a typical dry-land area in Montana. In this region they show essentially two types of life-history. One large group, containing most of the dominant species, hibernates in the egg stage. The larvae hatch early in May and pupate late in June. A second, somewhat smaller, group hibernates as partly grown larvae. These latter generally pupate at the end of May or beginning of June. In general, those species that hibernate as larvae fly in July when the sunflower is in bloom, while those hibernating as eggs fly late in August when rabbit brush (*Chrysothamnus* spp.) is in flower. Apparently the moths require to feed on the nectar of flowers in order to mature their eggs. Some species that hibernate as eggs, however, pupate immediately when fully fed, emerging in July. Two known examples of this are *Euxoa tessellata* and *E. idahoensis*. Others, belonging to the August group, undergo a dormant period of 2-4 weeks before pupation, e.g., *E. pallipennis*, *E. brevipennis* and *Porosagrotis orthogonia*. In a few species adult aestivation occurs, and these fly both in July and September. Thus *Chorizagrotis auxiliaris* hibernates as a larva, pupates in late May, emerges in early July, feeds, aestivates, and then flies again in early September, when it pairs and oviposits.

An analysis of the collections of the moths made in the district studied in 1925 shows that the general fauna is made up of several

groups, differing in their local distribution. Five groups are distinguished, and a table is given showing their local distribution. A further analysis of this grouping leads the author to the conclusion that the original fauna of the region, which was probably quite varied, has been greatly altered by the cultivation and subsequent abandonment of large areas of land, and that those species that were able to avail themselves of either cultivated or abandoned land have increased greatly, for example, *P. orthogonia*, *E. pallipennis* and *E. catenula*, and these now form the dominant elements of the fauna.

BABCOCK (K. W.). U.S. Bur. Ent. **The European Corn Borer, *Pyrausta nubilalis*, Hübner: II. A Discussion of its Seasonal History in Relation to various Climates.**—*Ecology*, viii, no. 2, pp. 177–193, 7 refs. Brooklyn, N.Y., April 1927.

The following is largely taken from the author's summary of this paper, which is the second of the series [*R.A.E.*, A, xv, 247] and deals with the seasonal history of *Pyrausta nubilalis*, Hb., as influenced by climate.

Individuals having different seasonal cycles are not "biological species" in the ordinary acceptance of the phrase. Different seasonal cycles in various areas are developed and are maintained as the result of climatic impress. After continued impress by a normal climate, the insect develops a rather stable response to this rhythm, which is not immediately lost when the impress originally producing it is removed, nor is it visibly altered in every case during short periods of climatic fluctuation. The insect's physiological constitution has several distinct optima, but the optimum considered as a whole seems to be the one-generation type of seasonal history. Fluctuations in abundance can occur annually in response to variations in climate, and are induced by changes which do not differ greatly in character for both one and two generation individuals. The effect, even of annual fluctuations in climate, tends to be cumulative. As regards the insect's distribution in the temperate climates, it is seen that one of the chief requirements for successful development is the dormant period under cold conditions. The period of dormancy when occurring under such conditions as prevail in south-western Russia and Hungary is undoubtedly accompanied by desiccation and must be followed immediately by a supply of contact moisture in order that pupation may be aided, one generation being produced as the seasonal cycle. Slightly colder conditions than those of Hungary during the dormant period, when accompanied by abundant moisture and followed by favourable conditions during the developmental season, can produce two generations. There is also a certain temperature requirement for the existence and development of two generations, below which moisture is not the principal factor in the determination of the cycle. More important than the latter fact in the direct correlation of the environment with the seasonal development of the insect, is that after this adaptation has continued for a certain period of time like intensities of factors stimulating the organism do not affect it to the same degree as before. This development of different physiological limits in individuals of different cycles is due in part to the intervention of the dormant period, with the physiological change that occurs at that time. It is essential to determine experimentally the part played by the dormant period in

the life of the insect, and the effect of environment upon its physiology in aiding the preparation for active development that occurs during this period.

PAYNE (N. M.). **Two Factors of Heat Energy involved in Insect Cold Hardiness.**—*Ecology*, viii, no. 2, pp. 194–196, 7 refs. Brooklyn, N.Y., April 1927.

There is a marked specialisation in insect cold hardiness [*R.A.E.*, A, xv, 339] in two directions, ability to withstand long periods of low temperature (quantity factor), and ability to withstand intense low temperatures (intensity factor). Hardiness to either factor may, however, be developed separately in some ecological groups and in some individuals. The most characteristic ecological group of insects that is specialised with regard to the quantity factor is the aquatic lake-dwelling group, which is able to withstand long periods of low temperature at or near the freezing point of water, but of which the author has not yet found any individuals able to withstand ice formation within their tissues. Certain soil insects normally living below the frost line constitute another ecological group that may be specialised with regard to the quantity factor.

The insects infesting grain and stored products are a somewhat heterogeneous group as regards their ability to survive low temperatures. As a group they are unable to withstand continued low temperatures in a dormant condition. *Ptinus fur*, L., however, and some species of *Trogoderma* may be able to withstand dormancy. *Tribolium confusum*, Duv., cannot survive it, but normally it may recover from temperatures as low as  $-14^{\circ}\text{C}$ . [ $6.8^{\circ}\text{F}$ .]. With *Calandra* (*Sitophilus*) *granaria*, L., there is more variability with regard to freezing points, but ability to survive in a dormant condition is limited. This variation occurs in this species as regards hardiness to both the intensity and quantity factors. In *Ephestia kühniella*, Zell., there is a decided specialisation with regard to the intensity factor; the larvae cannot withstand prolonged cold while dormant, but when partly dehydrated over calcium chloride can endure temperatures as low as  $-15^{\circ}\text{C}$ . [ $5^{\circ}\text{F}$ .].

Species normally exposed to extremes of low temperature during the winter months develop cold hardiness to both the intensity and quantity factors. In the oak-borer group of Coleopterous larvae, individuals develop ability to survive cold in a dormant condition (quantity factor) in September and October, but are then unable to withstand extremes of low temperature. Upon dehydration or gradual exposure to low temperature they become cold hardy to the intensity factor.

An interesting case of separation of the two factors involved in cold hardiness has recently occurred in a specimen of *Popillia japonica*, Newm., which endured cold in a dormant condition for ten months, but was unable to survive freezing. In this species there occur individuals capable of withstanding ice formation within their tissues and of becoming cold hardy to the intensity factor.

PAYNE (N. M.). **Measures of Insect Cold Hardiness.**—*Biol. Bull. Mar. Biol. Lab.*, lii, no. 6, pp. 449–457, 7 figs., 10 refs. Woods Hole, Mass., June 1927.

The author concludes that cold hardiness to the intensity factor of low temperature can be measured by moisture content, undercooling

point and blood conductivity. Conductivity measurements are found proportional to cold hardness throughout the whole year. For each species there is a different set of physical constants, which measure the cold hardness of that species.

Larvae of *Popillia japonica*, Newm., which hibernate below the frost line, do not exhibit any marked body weight changes over winter when kept in moist surroundings, but can be experimentally dehydrated to half their body weight, and then have a survival temperature as low as  $-28^{\circ}\text{C}$ . [ $-18.4^{\circ}\text{F}$ .]. Larvae of *Diacrisia virginica*, F., and *Isia isabella*, S. & A., show a marked water loss when they go into hibernation; up to the time when they can survive freezing the undercooling point of the blood is the minimum survival temperature, but after that time the undercooling point no longer measures the total cold hardness, which reaches to below  $-40^{\circ}\text{C}$ . [ $-40^{\circ}\text{F}$ .], and there is no free body fluid on which a conductivity reading can be made. Various Coleopterous larvae boring in oak are normally self-dehydrating, but never to the extent of losing all their free water. Although they are resistant to temperatures below  $-40^{\circ}\text{C}$ ., blood samples can always be obtained. There is a marked periodicity in their cold hardness, and also, but to a less extent, in that of *P. japonica*, whereas there is practically none in aquatic insects.

HOLLOWELL (E. A.), MONTEITH, jr. (J.) & FLINT (W. P.). **Leafhopper Injury to Clover.**—*Phytopathology*, xvii, no. 6, pp. 399–404, 3 figs., 3 refs. Lancaster, Pa., June 1927.

In the early summer of 1926 in Illinois plants of red clover (*Trifolium pratense*), which had just reached the blossoming stage in pots, were found to be affected with marginal and tip burning of the leaves, and with yellowing and dwarfing. These plants were heavily infested with leafhoppers, chiefly *Empoasca fabae*, Harris (potato leafhopper). In experiments with clover plants in insect-proof cages, plants subjected to the attack of *E. fabae* became brown and stunted after 12 days, and subsequently died, control plants remaining healthy throughout.

It was found that clover plants when sprayed with Bordeaux mixture remained comparatively free from leafhoppers and were much more vigorous and healthy than when heavily infested. In the field and in the experiments various European strains of red clover appeared to suffer rather more severely from the disease than the native American clovers. Different species of *Trifolium* and also other forage crops often exhibit during the summer symptoms similar to those on red clover which can be associated with large numbers of various species of leafhoppers, so that it may be assumed that the condition is caused largely by these insects. The symptoms vary somewhat with the different species of plant.

FAWCETT (G. L.). **The Curly Top of Sugar Beet in the Argentine.**—*Phytopathology*, xvii, no. 6, pp. 407–408, 2 refs. Lancaster, Pa., June 1927.

Experiments carried out to determine the vector of sugar-beet curly-top in Argentina have confirmed previous ones that it is *Agallia sticticollis*, Stål, previously erroneously identified as *Aceratogallia sanguinolenta*, Prov. Healthy sugar-beet plants were placed in cages and numbers of a species of *Eutettix* that attacks sugar-beet in Argentina

were introduced into some cages and of *A. sticticollis* into others. In all cages into which the latter was introduced curly-top developed; the plants in the control cages and those into which *Eutettix* sp. was introduced remained healthy. To facilitate the identification of the insects before introducing them into the cages the author exposed them to ether, which, he believes, has not previously been done, and which, if prolonged exposure is avoided, does not harm them.

CURRAN (C. H.). **Studies in African Tachinidae (Diptera).**—*Bull. Ent. Res.*, xvii, pt. 4, pp. 319–340, 1 ref. London, June 1927.

This paper includes a revision of the African species of the Tachinid genera *Actia* and *Zenillia* with keys. Among the new species described are *Zenillia illota* reared from *Xanthodes (Acontia) graellsii*, Feisth., and *Heliothis obsoleta*, F., in Tanganyika and also occurring in the Transvaal; *Z. normula* from *Acraea acerata*, Hew., in Uganda; *Z. vara* from *Arctornis (Porthesia) producta*, Wlk., in Zanzibar and also occurring in Kenya; *Sturmia laxa* from *H. obsoleta* and *Laphygma exempta*, Wlk., in Tanganyika and also occurring in Uganda and South Africa; *Campylochaeta pallidipes* from *Phytometra (Plusia) orichalcea*, F., in Kenya; and *Gonia munroi* from *L. exempta* in Tanganyika and also occurring in South Africa.

MYERS (L. E.). **The Generic Types of the Diaspidae (Hemiptera).** **Part II.**—*Bull. Ent. Res.*, xvii, pt. 4, pp. 341–346, 4 pls., 1 ref. London, June 1927.

This paper is a further contribution to the classification of the DIASPIDAE [R.A.E., A, xiii, 608]. The types dealt with are *Aulacaspis rosae*, Bch., *Chionaspis salicis*, L., *Lepidosaphes ulmi*, L. (*conchiformis*, Gmel.), and *Chrysomphalus aonidum*, L. (*ficus*, Ashm.).

DAVIES (W. M.). **Methods for collecting Parasites of Earwigs.**—*Bull. Ent. Res.*, xvii, pt. 4, pp. 347–350, 1 pl., 1 fig. London, June 1927.

In order to obtain a sufficient quantity of puparia of the two Tachinid flies, *Digonochaeta setipennis*, Fail., and *Rhacodineura antiqua*, Mg., for shipment to New Zealand, it was necessary to procure large numbers of *Forficula auricularia*, L., upon which they are parasitic. A search of likely hiding places yielded few earwigs, and these were captured with difficulty, but large numbers were found in the hollow stems of the Umbelliferous plant, *Heracleum sphondylium*. There is no evidence that the earwigs themselves bore into these stems, the holes present being caused by a Noctuid, *Dasypolia templi*, Thnb., dead adults, empty pupae-cases and parasitised larvae of which were found in the stems. It was found that earwigs could be trapped with equal success when entrance holes were cut by hand; and stems brought from the field, treated in this way and arranged in the hedges surrounding the laboratory, yielded quantities of earwigs. A few puparia of *D. setipennis* were found each day in the stems of *Heracleum*, but the prevalence of the Pteromalid hyperparasite, *Dibrachys cavus*, Wlk. (*boucheanus*, Ratz.) [cf. R.A.E., A, xv, 396] renders the utmost precautions necessary if these puparia, as well as those actually reared in the insectary, are to be used for export.

The cage used for the earwigs is described, and details are given of the methods of feeding them and collecting the puparia of the parasite.

Owing to the fact that earwigs prefer to remain inactive in a vertical position during the day, it was found necessary to insert rolls of brown paper or cardboard, or portions of the stem of *Heracleum* in an upright position, otherwise the earwigs collected in masses in the upper corners of the cages and cannibalism occurred.

The most efficient method adopted for the disposal of unwanted earwigs was that of throwing them into a bucket of water containing small quantities of chloroform and benzene; the chloroform, being heavier than water, destroyed any earwigs that sank and the benzene rapidly killed any that floated.

HODSON (W. E. H.). **The Bionomics of the Lesser Bulb Flies, *Eumerus strigatus*, *Flyn.*, and *Eumerus tuberculatus*, *Rond.*, in South-west England.**—*Bull. Ent. Res.*, xvii, pt. 4, pp. 373–384, 2 pls., 5 refs. London, June 1927.

A full account is given of observations on the bionomics of *Eumerus strigatus*, Fall., and *E. tuberculatus*, Rond. (lesser bulb flies) in south-west England, a briefer report of which has already been noticed [*R.A.E.*, A, xv, 366]. In no case in the experiments under notice were the two species bred from the same consignment of bulbs, and in nearly 90 per cent. of the total cases recorded the damage was attributable to *E. tuberculatus*. It is in the adult stage only that the two species may be separated with any degree of certainty, no reliable distinguishing character having been found in the egg, larval, or pupal stages, which are here described from specimens of *E. tuberculatus*. The adults emerge from the middle of May to the end of June, the males being observed approximately 3 days earlier than the females both in the insectary and in the field. Oviposition begins about 4–5 days after emergence, the earliest date on which the eggs were actually seen being 24th May. These hatched after 2 days, and the resultant larvae pupated about 20th June. Definite first brood adults were obtained from these pupae from 6th July. It is certain that the bulk of the second brood develops slowly and passes the winter as full-grown larvae in the bulbs before pupating, though some continue to emerge as adults up to the end of September. It seems very doubtful whether any of this generation produce yet another brood, since oviposition is very rare after the end of July. A few larvae pass the winter in a partly grown condition; these feed voraciously in the spring and do not pupate until about the middle of May. The resulting adults emerge with the normal first generation, and their progeny also may emerge during the same autumn or pass the winter as larvae. The entire winter is never passed in the pupal stage. The pupal period is relatively short, occupying about 14 days in June and July, and not more than 23 days in September. The author discusses the possible relation of moisture, food-supply, etc., to the time at which pupation occurs, but considers that the real reason why some larvae pupate in early autumn while others overwinter is probably the southern origin of the fly, the species not yet having become fully adapted to the seasonal changes experienced in Britain.

The males in captivity usually lived about 13 days, and the females about 15, though one female lived as long as 28 days. One female deposited 57 eggs, though it is possible that this number is normally greatly exceeded. The number of larvae found in a single bulb may vary from 2 or 3 to as many as 200. Unlike the larvae, the pupae

dislike very moist conditions, and migration therefore takes place from the attacked part of the bulb. The summer broods nearly always pupate in the neck or between the outer scales of the attacked bulb, or even higher up in the dried foliage at surface-level, rarely travelling far from the bulb and not burrowing through the ground unless this is of a very sandy nature. The emerging fly has no difficulty in making its escape, since the hole left above the bulb by the drying foliage is still present. In the spring, however, this hole has become filled in, and the foliage of the previous year has disappeared; the overwintering larvae, therefore, leave the food-plant and burrow through the soil, pupating almost at the surface, often many inches from the bulb.

An account is given of experiments dealing with the possible effect of injury (particularly by *Tylenchus dipsaci*, Kühn) on the infestation of bulbs by these flies, which showed that uninjured ones may be attacked. Remedial and preventive methods of treatment are discussed [*loc. cit.*].

HALL (W. J.). **The Introduction of *Cryptolaemus montrouzieri*, Muls., into Egypt.**—*Bull. Ent. Res.*, xvii, pt. 4, pp. 385–392, 2 pls., 3 refs. London, June 1927.

This paper gives details of the introduction of *Cryptolaemus montrouzieri* into Egypt, a briefer account of which has already been noticed [*R.A.E.*, A, xiv, 572]. In 1926 liberations of this Coccinellid against *Phenacoccus hirsutus*, Green (hibiscus mealybug) were only carried out in fresh localities, so that places in which liberations had been made in previous years might be kept under observation in order to ascertain whether any individuals had survived the winter. This procedure provided the first definite proof of success, since 13 individuals were found on a lebbek tree (*Albizzia lebbek*) in a locality where 7,000 Coccinellids had been liberated in 1925. No liberations had been made within ten miles of this place in 1926. The fact that one colony survived a winter indicates that there is every reason to hope that *C. montrouzieri* may be established in the field on a large scale. *P. hirsutus* is usually a pest of permanent trees and shrubs, which in Egypt are practically confined to towns and villages. Thus, even if the Coccinellid were established in a town, it does not seem probable that it would spread to other towns if the intervening area were devoid of food. There are, of course, other mealybugs that attack crops in the field, but it does not seem likely that *C. montrouzieri* would leave the rich feeding ground in a town to search for prey in the poorer country outside. It follows, therefore, that the beetle will have to be established separately wherever the damage is severe enough to justify such measures. This is not an impossible proposition, since the number of towns in Egypt where colonisation would be necessary is not great.

OGLOBLIN (A. A.). **Two new Scelionid Parasites of *Locusta migratoria*, L., from Russia.**—*Bull. Ent. Res.*, xvii, pt. 4, pp. 393–404, 7 figs. London, June 1927.

Descriptions are given of *Scelio uvarovi*, sp. n., bred from the eggs of *Locusta migratoria*, L., ph. *danica*, L., in Ukraine and *S. nikolskyi*, sp. n., bred from the eggs of *L. migratoria* in Turkestan.

All the representatives of the cosmopolitan genus *Scelio*, Latr., so far as is known, are parasites of the eggs of ACRIDIDAE. J. J. Kieffer

mentions, among other generic characters, the four-jointed palpi, and he further distinguishes the Australian genus *Neoscelio*, Dodd, from *Scelio* by its having three-jointed maxillary palpi besides the long metathoracic spine. Dissection by the author of a few specimens of three species of *Scelio*, *S. vulgaris*, Kieff., *S. uvarovi* and *S. nikolskyi*, showed that in both sexes of all the species the maxillary palpi were only three-jointed. The generic definition of the genus *Scelio* must therefore be corrected in this sense.

LYLE (G. T.). **Two new Species of *Apanteles* (Hym., Braconidae).**—*Bull. Ent. Res.*, xvii, pt. 4, pp. 415–416. London, June 1927.

*Apanteles thompsoni*, sp. n., of which only females are known, is a solitary parasite of the larvae of *Pyrausta nubilalis*, Hb. (corn borer) in the north of France. *A. diparopsidis*, sp. n., both sexes of which are described, was bred from larvae of *Diparopsis castanea*, Hmps. (red bollworm) in the Transvaal.

WILKINSON (D. S.). **On three new Species of Ichneumonidae.**—*Bull. Ent. Res.*, xvii, pt. 4, pp. 417–420. London, June 1927.

*Rhyssa persuasoria himalayensis*, subsp. n., is described from India, and as *R. persuasoria*, L., commonly parasitises various species of *Sirex*, notably *Sirex gigas*, L., in Europe, and since wood-wasps of this genus are known to occur in India, it is very possible that one of them was the host in this instance. *Anilastus laphygmae*, sp. n., from the Transvaal, was bred from the larvae of *Laphygma exempta*, Wlk., and *Pristocelus fumipennis*, sp. n., from the Federated Malay States, from *Lamprosema diemenalis*, Gn., *Pycnarmon cribrata*, F., and an unidentified Pyralid larva.

FERRIÈRE (C.). **Parasites de *Perrisia pyri*, Bouché (Dipt., Cécidom.).**—*Bull. Ent. Res.*, xvii, pt. 4, pp. 421–422. London, June 1927.

The following parasites collected by Dr. J. G. Myers in France [cf. *R.A.E.*, A, xiv, 523] are recorded from *Perrisia pyri*, Bch.: *Inostemma boscii*, Jur., *Misocyclops marchali*, Kieff., *Torymus abbreviatus*, Boh., *Eurytoma aciculata*, Ratz., *Tetrastichus brevicornis*, Nees, and a species of *Entedon*, possibly *E. metallicus*, Nees. Only the first three can be considered of economic importance.

There appears to be a biological as well as a morphological difference between *I. boscii* and *I. piricola*, Kieff., which was obtained from *Contarinia pyrivora*, Riley, by Marchal, since the latter, according to him, appears in April and has but one generation a year, while *I. boscii* was obtained in July and August.

KISHIDA (K.). **On *Tetranychus kanzawai*, sp. n., injurious to Mulberry.** [In Japanese.]—*Dobuts. Zasshi [Zool. Mag.]*, xxxviii, no. 460, pp. 105–107. Tokyo, February 1927.

A new mite, *Tetranychus kanzawai*, injurious to mulberry leaves in the Yamanashi Prefecture, is described.

KUWANA (I.). **A new Eriococcus from Japan.** [In Japanese.]—Dobuts. Zasshi [Zool. Mag.], xxxix, no. 461, pp. 109–113, 3 pls. Tokyo, March 1927. (With a Summary in English.)

*Eriococcus abeliceae*, sp. n., is described from *Abelicea hirta* in Japan; the author recorded this species as *Gossyparia ulmi*, Geoff., in 1902.

HORI (M.). **On the Biology of *Oecanthus longicauda*, Mats.** [In Japanese.]—Dobuts. Zasshi [Zool. Mag.], xxxix, no. 461, pp. 129–147. Tokyo, March 1927.

The tree-cricket, *Oecanthus longicauda*, Mats., which occurs in the northern half of Japan, has one generation a year, and hibernates in the egg stage in the stalks of its various food-plants, including *Artemisia*, *Chenopodium*, soy-bean [*Glycine hispida*], chrysanthemum and grape. The eggs hatch in the latter half of July, and the nymphs moult five times, reaching the adult stage from the middle of August onwards. In the field the crickets fed on the Aphids, *Cryptosiphum artemisiae*, Buckt., and *Aphis glycines*, Mats., and a red mite, besides the various plants mentioned above, and in captivity on *Thrips tabaci*, Lind., the larvae of *Pieris rapae*, L., and *Barathra brassicae*, L., and the pupae of *Apanteles glomeratus*, L. The larvae of a beetle, *Mordellistena* sp., destroy the eggs of *O. longicauda* in the tissue of the food-plants.

KUWANA (I.) & ISHII (T.). **On *Prospaltella smithi*, Silv., and *Cryptognatha* sp., the Enemies of *Aleurocanthus spiniferus*, imported from Canton, China.** [In Japanese.]—Jl. Okitsu Hortic. Soc., no. 22, pp. 77–80, 1 pl. Okitsu, Japan, March 1927.

Two natural enemies of the Aleurodid, *Aleurocanthus spiniferus*, Quaint., were introduced from Canton into the Nagasaki Prefecture, Japan, where it is very injurious to *Citrus*, by Dr. F. Silvestri, in May 1925. The Eulophid, *Prospaltella smithi*, Silv., which oviposits in the first instar nymphs of *A. spiniferus*, seems to have become established, 74.2 per cent. of the Aleurodids being killed by it in the field; like its host, it has four generations a year. The Coccinellid, *Cryptognatha* sp., does not appear to have become established.

**Report of the Studies on Economic Birds and Animals, no. 4.** [In Japanese.]—160 pp., 9 pls. Tokyo, Bur. Anim. Ind., Dept. Agric. & Forestry, March 1927.

This report consists of a series of papers by S. Kuzu and K. Kishida, dealing with the food of a number of insectivorous birds and mammals in Japan.

TAKAHASHI (R.). **Thirteen Species of Aphididae collected by Prof. C. R. Kellogg in China.** [In Japanese.]—Trans. Nat. Hist. Soc. Formosa, xvii, no. 90, pp. 238–239. Taihoku, Formosa, June 1927.

The following Aphids collected in the province of Fukien are recorded for the first time from China: *Macrosiphum formosanum*, Tak., and *M. paederiae*, Tak., on unknown food-plants; *M. (Macrosiphoniella)*

*citricola*, v.d.G., on a palm; *M. (M.) formosartemisiae*, Tak., on *Artemisia*; *Myzus persicae*, Sulz., on cauliflower and *Cineraria*; *Toxoptera graminum*, Rond., on wheat; *T. aurantii*, Boy., on tea; *Aphis tavaresi*, Del Guer., on *Citrus*; *Brachycolus heraclei*, Tak., on an unknown plant; *Setaphis viridis*, v.d.G., on *Phyllanthus*; *Neophyllaphis podocarpi*, Tak., on an unknown plant; *Oregma lanigera*, Zehnt., on sugar-cane; and *O. bambusicola*, Tak., on bamboo.

#### **Importation of Potatoes (Canary Islands) Order of 1927.**

**Importation of Potatoes (Malta) Order of 1927.**—*Statutory Rules & Orders*, 1927, nos. 377 & 571. London, 2nd May & 21st June 1927.

To prevent the introduction of *Phthorimaea operculella*, Zell. (potato moth), the landing in England or Wales of any potatoes grown in the Canary Islands or Malta is prohibited, unless accompanied by a prescribed certificate.

FRANSSSEN (C. J. H.). *Aphis fabae*, Scop., en aanverwante soorten in Nederland. [*A. fabae* and related Species in Holland.]—[12+] 90 pp., 2 pls., 4 tables, 70 refs. Wageningen, H. Veenman & Zonen, 1927.

The investigations described in this thesis were made at Wageningen to obtain information on the identity of the bean aphid. English workers refer all "black Aphids" occurring on various crops and weeds to *Aphis rumicis*, L., while according to Börner and his students there are several morphologically and biologically distinct species [cf. *R.A.E.*, A, xiv, 193] of which only one, *Aphis fabae*, Scop., is injurious to certain crops. Series of breeding and infestation experiments were made with the various Aphids (some material being obtained from Germany), and the offspring were compared with the results of a microscopic examination of the adult stages. The material was obtained in part from the experiments and in part from collections from various plants in the field.

In mentioning the various Aphid names, the author's name is followed in brackets by that of the more recent author whose interpretation of the species is accepted. The following methods were used to obtain pure strains of the various Aphids for the infestation experiments. Young larvae that hatched in March 1926 on *Euonymus* were placed on broad beans (*Vicia faba*). It was assumed that only *A. fabae*, Scop. (Börner), would maintain itself, all the others dying out, and this assumption proved correct. In the case of the other Aphids, collection in the field was followed by isolated breeding on their natural food-plants and by microscopical examination. They proved morphologically and biologically distinct from one another. The characters common to the representatives of the *fabae* group and to those of the allied groups are described. *A. fabae*, Scop. (Börner), *A. cardui*, L. (Franssen) (with a new variety, *naumburgensis*, from Germany), *A. viburni*, Scop. (Börner), *A. ilicis*, Kalt. (Börner & Janisch), *A. rumicis*, L. (Börner), *A. hederæ*, Kalt. (v. d. Goot & Franssen), *A. euonymi*, F. (Börner), *A. mordwilkoï*, Börner & Janisch, *A. philadelphi*, Börner, *A. podagrariæ*, Schr., *A. börneri*, sp. n. (separated from *A. hederæ* and strictly monophagous on *Hedera helix*; hitherto found only in Naumburg a. S. and Baden), all of which belong to the *fabae* group, and *Ceruraphis viburnicola*, Börner,

are dealt with separately as regards synonymy (non-European literature being disregarded), description, distribution, food-plants and biology.

The Dutch examples of *A. fabae* agree with the English descriptions [of *A. rumicis*] by Theobald and Davidson. Contrary to the findings of Börner and Janisch, it proved possible to infest with it *Rumex obtusifolius* and *R. crispus* (which curiously enough were also infested by material sent by Börner from Naumburg), while the non-infestation of *Aegopodium podagraria*, *Hedera helix* and *Solanum nigrum* was in agreement with their results. The cultivated plants infested by *A. fabae* include in order of importance, *Vicia faba*, beet (*Beta vulgaris*), poppy (*Papaver somniferum*), runner beans (*Phaseolus vulgaris*), and several garden plants.

In Holland the fundatrices hatch on *Euonymus* and other winter food-plants in the second half of March and begin feeding at once. They mature in 3–4 weeks and begin producing young 2–4 days after the last moult. The young are found only on the lower surfaces of the leaves, curling of which then becomes noticeable. The mature apterous and alate fundatrigeniae appear in the second half of April. The alate form migrates to the summer food-plant, preferably *Vicia faba*, without depositing young on the winter one. The term "migration" is restricted to movement between the primary food-plant and the summer one, and is not used for movement between alternative summer plants. The harmfulness of *A. fabae* depends on the weather in spring; moist, warm weather hastens development. The gynoparae appear on the winter food-plants early in September, reach their maximum early in October, and disappear early in November. The males occur within the same period. Mating takes place on the winter food-plant, and the eggs are deposited 1–3 days later. In 1925 *A. fabae* was found hibernating on *Viburnum opulus* and *Euonymus* spp. At the end of 1926 gynoparae, mature sexuales and eggs (which last yielded normally reproducing fundatrices) were found on *Deutzia crenata* and *Philadelphus coronarius* at Roermond, although these bushes were not infested at Wageningen. *A. fabae* is the only species of economic importance in Holland. It is very harmful and its control seems almost impossible.

The following species of the *fabae* group, determined on morphological and biological characters, occur in Holland. *A. cardui* probably does not migrate, but oviposits on *Cirsium* and *Carduus*; it is parasitised by *Aphidius* sp. *A. viburni* lives and hibernates on *Viburnum opulus*; *Rumex obtusifolius* was artificially infested with it, but only temporarily. *A. ilicis* lives on *Ilex*, especially *I. aquifolium*; artificial infestation of *R. obtusifolius*, *R. crispus* and *V. opulus* was successful up to a period of two months. *A. rumicis* lives on *R. obtusifolius*, *R. maritimus* and *R. hydrolapathum*, and a temporary infestation of *R. crispus* was obtained artificially. Though very general in Holland, little was ascertained about its biology because this Aphid differs notably from the others, and it was thought that it did not belong to the *fabae* group; it is here considered to be the link between the *fabae* group and the *acetosae-intybi* group. *A. hederarum* has as yet been found only in Holland and only on *Hedera helix*; oviposition occurs only very exceptionally.

*A. euonymi*, *A. mordwilkoii*, *A. philadelphi*, and *A. podagrariae* have not been found in Holland. *Ceruraphis viburnicola*, Börn., which occurs on *Viburnum opulus*, does not seem to be identical with *Anuraphis viburnicola*, Gill., as believed by Börner, and the author therefore proposes the name *C. viburniana* for the former. In Holland it is the first Aphid to appear on the leaves of *Viburnum*.

GOFFART (H.). *Aphelenchus neglectus*, Rensch (Nematode) als Krankheitserreger. [*A. neglectus* as a Cause of Disease.]—*Nachrichtenbl. deutschen Pflanzenschutzdienst*, vii, no. 6, pp. 53–54, 1 fig. Berlin, June 1927.

Previous observations on *Aphelenchus neglectus*, Rensch, infesting the roots of various crops in Germany [*R.A.E.*, A, xii, 297] are confirmed. The female Nematodes appear to enter the roots of the young plants and to oviposit there. The larvae feed on the cell-sap and then wander into the soil, where they become mature and where fertilisation occurs. The males appear to live permanently in the soil. The rate of development depends on the weather: there may be 5–6 generations a year.

SCHIEDTER (F.). **Die Kiefernbestands-Gespinstblattwespe** (*Lyda stellata*, Christ). [The Pine Web Sawfly, *Acantholyda stellata*.]—*Forstl. Flugblätter*, no. 9, 7 pp., 6 figs. Neudamm, 1926. [Recd. July 1927.]

The life-history of the pine web sawfly, *Acantholyda* (*Lyda*) *stellata*, Christ, is briefly described. The life-cycle usually requires two or three years, though instances have been observed in which it was completed in a single year. When mature, the larva enters the ground and may rest there for years until pupation occurs, 2 or 3 weeks before emergence. *A. stellata* can do serious harm to 40–100 year old pines, not so much directly as by rendering the trees liable to the attack of secondary pests, such as bark-beetles and weevils. The adults occur from the end of April to June. The excreta of the various larval stages resemble those of the pine moth [*Panolis flammea*, Schiff.], and illustrated descriptions are given to enable their easy determination as signs of infestation. The information on parasites and on the uselessness of banding has already been noticed [*R.A.E.*, A, xiv, 314, 382]. Where only a small area is infested, pigs are of value for destroying the larvae in the ground.

SCHIEDTER (F.). **Die gemeine Kiefernbuschhornblattwespe**, *Lophyrus pini*, L. [The Common Pine Sawfly, *Diprion pini*.]—*Forstl. Flugblätter*, no. 10, 8 pp., 9 figs. Neudamm, 1926. [Recd. July 1927.]

The common pine sawfly, *Diprion* (*Lophyrus*) *pini*, L., has one generation a year in the Bavarian plateau, and two in warmer regions, such as on the Rhine. In Bavaria the adults occur in June and July, and in warmer districts they are on the wing in April–May and July–August. There is an average of two females to one male. The eggs hatch in two or three weeks. The larva feeds from near the tip of the needle downwards to the sheath. Hibernation invariably occurs as a mature larva in the cocoon. *D. pini* usually infests young trees. Its attack is rarely of any direct importance, but may result in serious infestation by secondary Coleopterous pests. It has numerous natural enemies, including parasitic Hymenoptera as well as birds and mammals. Numbers of larvae are also destroyed by heavy rain and hail or by early frosts in autumn, so that artificial measures are very rarely needed. The collection and destruction of the larvae is the only one practicable except in a very severe and concentrated infestation, when spraying may be of value.

SCHEIDTER (F.). **Unsere Fichtenlärchenchermes.** [Our Spruce-Larch Chermes.]—*Forstl. Flugblätter*, no. 11, 9 pp., 12 figs. Neudamm, 1926. [Recd. July 1927.]

In Germany the stem-mothers of *Chermes viridis*, Ratz. (green spruce chermes) occur on spruce, especially on young plants, in early spring and produce galls that enclose their offspring. From mid-August onwards the nymphs issue from the galls, moult, and become winged migrants that fly to larch, and there deposit about 40 eggs each. The resultant larvae remain on larch until spring, and become mother exules, each laying about 15 eggs. In a fortnight the larvae hatch and wander to the needles, where they become winged sexuparae. The latter fly back to spruce in May and June, attach themselves to the previous year's shoots, and lay about 10 eggs each. The resulting larvae become apterous, sexed individuals, forming the fifth and final generation of the cycle. From the single egg laid by each female there hatches in September a larva that in spring becomes the fundatrix. As the infestation of the larch is of short duration, little injury is done to it.

Though there is some doubt on the question, the author considers that *C. abietis*, L. (yellow spruce chermes) is a distinct species. The only difference in development is that the winged migrants do not fly to larch; they attack other spruce trees or remain on the old one.

*Chermes (Cnaphalodes) strobilobius*, Kalt. (red spruce chermes) produces smaller galls than the two preceding species. The winged migrants infest larch in June and July and lay about 20 eggs each. The larvae feed for a short time on the needles and then attach themselves to the trunks and branches and hibernate there. In spring they wander to the buds, become exules in March–April, and lay about 150 eggs each. A small proportion of the resultant larvae wander to the woody parts of the branches and remain there until the next spring, when they become mother exules that oviposit at the bases of the larch buds. The majority of the larvae continue on the needles and produce two forms: apterous aestivales and winged sexuparae. The former remain on the larch needles, oviposit and give rise to a second or even third generation during the summer. The whole of the final one (and a small portion of the others) produce mother exules in spring. The winged sexuparae return to the spruce, oviposit and give rise to the sexed individuals forming the fifth and final generation. The single egg laid by each female produces the fundatrix form.

The spruce generations of *C. viridis* and *C. abietis* prefer young trees; *C. strobilobius* is almost exclusively found on old ones. The first two occur not only on common spruce [*Picea excelsa*], but also on *P. alba*, *P. pungens*, *P. engelmanni*, *P. obovata*, *P. orientalis*, and *P. sitchensis*. The gall-producing generations are comparatively unimportant, but trees weakened by severe infestations may be killed by secondary pests. Prolonged rains during the migration time of the winged generations may prevent the change of food-plant and thus destroy the Aphids. Among birds, tits destroy large numbers. Coccinellid beetles of the genera *Scymnus* and *Novius* and a number of other insects are valuable natural enemies, but the Hymenopterous parasites are unimportant. Artificial measures, such as breaking open the galls, or crushing the stem-mothers, are of very limited application.

KRAUSSE (A.) & SCHULZ (—). **Unsere Ameisen, besonders die Waldameise und ihre künstliche Vermehrung.** [Our Ants, especially the Forest Ant and its artificial Increase.]—*Forstl. Flugblätter*, no. 13, 12 pp., 1 fig. Neudamm, 1926. [Recd. July 1927.]

The senior author states that forest ants are perhaps the first insects for the protection of which legislation was enacted, as shown by German laws of 1879 and 1880. The opinions of leading authorities are cited on the beneficial action of ants and an annotated list is given of the German species. For observation, the senior author uses glass dishes shaped like soup-plates, with a groove running all round within the upturned edge. The groove is filled with oil, which is an effective barrier. The ants can thus be watched without any intervening pane of glass. The junior author describes his method of favouring the increase of ants, *Formica rufa*, L., and *F. sanguinea*, Latr., as a protection against Lepidopterous pests of forests [*R.A.E.*, A, xiii, 208–209].

FRANZ (—). **Nonnenbekämpfung durch Bestäubung vom Flugzeuge aus.** [Nun Moth Control by Dusting from an Aeroplane.]—*Forstl. Flugblätter*, no. 15, 5 pp. Neudamm, 1926. [Recd. July 1927.]

An account is given of a successful experiment in dusting an arsenical from an aeroplane to destroy the nun moth [*Lymantria monacha*].

SCHEIDTER (F.). **Forstschädliche Insekten der Fichte. Forstschädliche Insekten der Kiefer.** [Forest Insect Pests of the Spruce. Forest Insect Pests of the Pine.]—*Forstl. Flugblätter*, no. 17, 4 pp., no. 18, 4 pp. Neudamm, 1926. [Recd. July 1927.]

In these two tables the pests are divided according to their occurrence in seed, cones, seedlings, young plants and stands, and the exact part infested is indicated. There are also sections dealing with the pests of the felled timber.

GUSSONE (H.). **Vorbereitung und Durchführung einer Insektenbekämpfung durch Arsenbestäubung.** [The Preparation for and Execution of Insect Control by the Dusting of Arsenic.]—*Forstl. Flugblätter*, no. 20, 9 pp., 2 refs. Neudamm, 1927.

This article reviews all the various problems connected with the dusting of a forest with an arsenical insecticide from aeroplanes.

DINGLER (M.). **Schädlingstabelle. (Die wichtigsten Forstinsekten nach ihrer Verteilung auf die Holzarten und Baumteile.)** [Table of Pests. The most important Forest Insects divided according to the Species of Trees and the Parts of Trees infested.]—*Forstl. Flugblätter*, no. 21, 22 pp. Neudamm, 1927.

This list is the same as one recently noticed [*R.A.E.*, A, xv, 420].

REH (L.). **Der Apfel-Blattsäuger.** [The Apple Leaf Sucker.]—*Korresp.-bl. wirtsch. Schädlingsbekämpfung*, iv, no. 1, reprint 1 p. [Treves ?] January 1927. [Recd. July 1927.]

Referring to the infestation of apple trees in the Lower Elbe districts by the apple-sucker, *Psylla mali*, Schm. [*R.A.E.*, A, xiv, 110], the

author states that twenty-five years' observations indicate that the winter moth [*Cheimatobia brumata*] is an even more important pest of apples. Against *P. mali* spraying with a good fruit-tree carbolineum of 15 per cent. strength, Theobald's mixture or a solution of 5 lb. caustic soda and 2½ lb. soft soap in 100 gals. water is very effective if applied early in April. If the presence under the trees of such plants as strawberries or bush-fruits makes earlier spraying (March) necessary, the carbolineum must be of 20 per cent. strength. A nicotine sulphate solution of ½ per cent. strength may be used against the nymphs. Fumigation with tobacco in large quantities is the only measure against the adults.

FERRIÈRE (C.). **Chalcidiens parasites de la cochenille du pin** (*Leucaspis pini* Hart.).—*Rev. suisse Zool.*, xxxiv, no. 1, pp. 55–67, 5 figs., 21 refs. Geneva, March 1927.

The following Chalcid parasites were bred from *Leucaspis pini*, Hart., on *Pinus sylvestris* in Valais: *Azotus pinifoliae*, Merc., and *Prospaltella leucaspidis*, Merc., hitherto only known from Madrid; *P. aurantii*, How., widely distributed in the United States, but in Europe hitherto recorded only from Italy; *Aphelinus mytilaspidis*, LeB., a cosmopolitan parasite of several species of *Diaspis*, but here recorded for the first time from *L. pini*; and *Anthemus pini*, sp. n. All the parasites except *P. leucaspidis* are described.

MÜLLER-RUTZ (J.). **Die Schmetterlinge der Schweiz**. [Swiss Lepidoptera.]—*Mitt. Schweiz. ent. Ges.*, xiii, no. 10, pp. 499–533. Berne, 15th June 1927.

The meal-moth, *Ephestia kühniella*, Zell., was obtained in 1922 from walnuts and since then several generations have been bred in a box of walnuts. The Tineid, *Gracilaria azaleella*, Brants, was found on azaleas in 1925, this being the first record of this species from Switzerland.

WICHMANN (H. E.). **Ueber die geographische Verbreitung der Ipiden. II. Die Ipidenfauna Niederösterreichs und des nördlichen Burgenlandes**. [On the geographical Distribution of the Scolytidae. II. The Scolytid Fauna of Lower Austria and of northern Burgenland.]—*Kol. Rundsch.*, xiii, nos. 1–2, pp. 42–80. Vienna, 28th February & 28th April 1927.

The contents of this paper are indicated by its title.

[PARFENT'EV (I. A.).] Парфентьев (И. А.). **A Study on the Toxicity of Calcium Arsenate and Arsenite**. [*In Russian*.]—*Défense des Plantes*, iii, no. 6, pp. 454–462, 18 refs. Leningrad, December 1926. (With a Summary in English.) [Recd. May 1927.]

Previous work, particularly of American authors, on the toxicity of calcium arsenate and calcium arsenite is reviewed, and personal experiments are briefly described. In the latter the compounds were used with varying arsenic and calcium contents and were tested on cockroaches by mixing the poison with bread crumbs. The

toxicity of the compounds may be increased by raising the arsenic content ( $\text{As}_2\text{O}_5$  or  $\text{As}_2\text{O}_3$ ) or lowering the calcium content ( $\text{CaO}$ ). The best results (100 per cent. mortality) were obtained with baits containing 2.5 per cent. of calcium arsenate prepared from 67.03 per cent. of  $\text{As}_2\text{O}_5$  and 7.14 per cent. of  $\text{CaO}$ , their relative proportion being 9.38 to 1. The same amount of calcium arsenite prepared from 72.6 per cent. of  $\text{As}_2\text{O}_3$  and 23.13 per cent. of  $\text{CaO}$  killed only 90 per cent. of the cockroaches, but when the bait contained 5 per cent. of the compound all cockroaches were killed. The effect of the addition of lime or sulphur to the baits has already been noticed [*R.A.E.*, A, xiv, 420]. Arsenic trioxide ( $\text{As}_2\text{O}_3$ ) alone is less toxic than when in combination with calcium oxide; the bait must contain at least 10 per cent. of the poison for effective control.

[IVANOVA-ALEKSANDROVSKAYA (Z. V.) & PARFENT'EV (I. A.).] **Иванова-Александровская (З. В.) и Парфентьев (И. А.). Experiments with Insecticides—Arsenicals and Carbon Bisulphide—from the Point of View of stimulating Plant Growth.** [*In Russian.*—*Défense des Plantes*, iii, no. 6, pp. 467–479, 6 refs. Leningrad, December 1926. (With a Summary in English.) [Recd. May 1927.]

For the purpose of these experiments cabbages and turnips were used, the insecticides tested being calcium arsenate, calcium arsenite, Paris green and sodium arsenite. The poisons were applied to the soil before sowing, and in some cases the plants were watered with sodium arsenite. The poisons had a marked stimulating effect on the plants, but further experiments are necessary in order to determine the optimum dosage and method of application. The germination of seed was improved by fumigating it with carbon bisulphide.

[KOROTKIKH (G. I.).] **Коротких (Г. И.). The First Expedition for the Control of Locusts by Aeroplanes.** [*In Russian.*—*Défense des Plantes*, iii, no. 6, pp. 479–518, 18 figs., 6 refs. Leningrad, December 1926. (With a Summary in English.) [Recd. May 1927.]

This is a detailed account of the work and organisation of the expedition against locusts in Northern Caucasus [*R.A.E.*, A, xiv, 30, 395].

[PARFENT'EV (I. A.).] **Парфентьев (И. А.). Report of the Work of the Avia-chemical Expedition of the People's Commissariat of Agriculture and the Aviachim.** [*In Russian.*—*Défense des Plantes*, iii, no. 6, pp. 518–532. Leningrad, December 1926. (With a Summary in English.) [Recd. May 1927.]

Prior to the experiments with aeroplanes for the control of locusts recorded in the preceding paper several tests were made to determine the best insecticide for the purpose. The calcium arsenate available contained about 40 per cent.  $\text{As}_2\text{O}_5$  and did not give satisfactory results. In order to obtain at least 90 per cent. mortality it was necessary to use 3–4 lb. of Paris green or sodium arsenite to the acre. Smaller doses were not sufficiently effective when the poison was used either alone or with a carrier. The addition of a carrier greatly increases the bulk of the dust, making it less practical for use from aeroplanes; the evenness of distribution may be regulated mechanically from the machine. As the dust was applied on uncultivated land, mainly reed beds, the question of scorching vegetation was not considered.

[VUISHELESSKAYA (N. S.).] Вышелесская (Н. С.). **The Behaviour of Locusts towards Plants dusted with Poisons.** [In Russian.]—*Défense des Plantes.*, iii, no. 6, p. 533. Leningrad, December 1926. (With a Summary in English.) [Recd. May 1927.]

Experiments showed that Paris green and sodium arsenite are distinctly repellent to locusts, whereas leaves dusted with calcium arsenate or one of the carriers, such as chalk, lime or sulphur, are attacked as readily as the untreated leaves. Sodium arsenite caused considerable and Paris green only slight scorching of reeds.

[VUISHELESSKAYA (N. S.).] Вышелесская (Н. С.). **Experiments on the Adhesiveness of Insecticides and Carriers.** [In Russian.]—*Défense des Plantes*, iii, no. 6, pp. 534–536. Leningrad, December 1926. (With a Summary in English.) [Recd. May 1927.]

In tests in which reeds were dusted in the afternoon, flour adhered best of the various carriers, the others in order of adhesiveness being chalk, lime, and sulphur; none of them, however, withstood the effects of rain. When applied early in the morning with the dew still on the plants these substances adhered for as long as 4 days in spite of strong winds and rain, and in the case of flour even for 8 days. Sodium arsenite, calcium arsenate and Paris green applied while the dew was still on the plants adhered for 3 days, after which they were washed off by heavy rains. The same insecticides applied in the absence of dew did not adhere so well. Experiments were also made while the dew was present with sodium arsenite applied at the rate of 10 lb. to 3 acres alone and with the addition of an equal quantity of chalk. An examination about 4 hours later showed an average of 84 particles per sq. cm. of leaf surface in the first case and 110 in the second. The dusts were washed off by rain on the third day. Only an average of 14 particles per sq. cm. was noticed in the case of sodium arsenite and chalk applied in the absence of dew.

[ÉNGEL'HARDT (V. M.).] Энгельгардт (В. М.). **Some Lamellicorn Beetles injurious to Agriculture in the Far East.** [In Russian.]—*Défense des Plantes*, iv, no. 1, pp. 4–9, 3 figs. Leningrad, April 1927.

*Lachnosterna (Holotrichia) diomphalia*, Bates, is a serious pest of field crops in the far east of Siberia, the damage being done by the larvae. The adults are abundant at night towards the end of June and in July, feeding on the leaves of various trees such as lime, birch, etc.; during the day they burrow into the soil to a depth of just over an inch. The greatest injury by the larvae is done from July to September. In the northern regions of the area the life-cycle of this beetle probably lasts three years. In the southern region *L. (H.) sichotana*, Brenske, is believed to have a life-cycle of 2 years. The larvae of the latter caused considerable injury in 1926 to sugar-beet, potatoes, and to a certain extent to soy-beans [*Glycine hispida*].

*L. (Brahmina) sedakovi*, Mannerh., and *L. (B.) intermedia*, Mannerh., occur with the above species, and the larvae may possibly be mistaken for them. The adults of *L. sedakovi* feed on the foliage of trees, willow being preferred, though apple and plum trees are also attacked. To judge from the annual flight there is probably one generation a year.

The genus *Liocola* (*Pachnotosia*) is represented by *L. lugubris*, Hbst. (*marmorata*, F.) and *L. brevitarsis*, Lewis, the latter being a common pest. In June and July the adults may be seen in large numbers on the trunks of pear, apple, oak and willow, where they feed on the sap exuding from injured places. On the fruit trees they also attack the fruit. During August and September they occur in large numbers on maize and *Sorghum*, damaging the soft top grains and feeding on the exuding sap. In the case of these crops and of pear trees they are only attracted to plants previously injured by other insects, but they must be considered as serious pests, as owing to their abundance they completely destroy the fruit and cause the cobs of maize and *Sorghum* to decay.

*Phyllopertha* (*Proagopertha*) *acutisterna*, Fairm., *Oxycetonia* (*Gametis*) *jucunda*, Fald., and *Glycyphana* (*Glycetonina*) *fulvistemma*, Mot., were recorded as pests in Ussuri for the first time in 1926. The adults appear at the end of May and beginning of June, attacking the blossoms of pear, apple and plum trees. Their bionomics and the amount of injury caused by them have not yet been studied. *Ectinohoplia rufipes*, Mot., was also recorded for the first time in 1926. The full-grown larvae were found at a depth of about 1-2 inches in the soil under trees on 10th May, they pupated the following day and the adults emerged on 25th June. They immediately attacked the leaves of apples and pears, completely defoliating them and leaving only a network of veins. Pairing was observed during the first ten days of July, and by the end of the month the beetles had completely disappeared. It is believed that this species has a two year life-cycle. Other food-plants are birch, hazel and poplar.

*Popillia japonica*, Newm., though abundant, is not a serious pest, but in view of the damage caused by it in North America a special study is to be made of its biology under native conditions.

In September *Maladera renardi*, Ball., caused considerable injury to soy-beans by eating the leaves.

[ZORIN (P. V.). Зорин (П. В.). Observations on *Aleochara bilineata*, Gyll. [In Russian.]-*Défense des Plantes*, iv, no. 1, pp. 9-12, 1 fig. Leningrad, April 1927.

The Staphylinid, *Aleochara bilineata*, Gyll., is both parasitic and predacious on *Phorbia* (*Hylemyia*) *brassicae*, Bch., and *P. (H.) floralis*, Fall. The larvae enter the cocoons of the host in the soil and feed on the pupae, and the adults feed on the larvae. In Leningrad *A. bilineata* always occurs in association with *P. brassicae*, though the percentage of parasitism by the larvae is very variable (6-85).

Under laboratory conditions the life-cycle from egg to adult lasts about a month at temperatures of 18°-19° C. [64.4°-66.2° F.]; at temperatures of 28°-30° C. [82.4°-86° F.] complete development only requires 18-20 days. When the larvae are reared from eggs kept at temperatures of 14°-15° C. [57.2°-59° F.] and lower, they enter the cocoon of the host, but after a few days' feeding at temperatures of 18°-19° C., they enter a diapause without reaching the second instar. It is in this stage that they hibernate in nature. This diapause evidently depends on the temperature to which the eggs are exposed and not on the time of year, as similar results were obtained during April. In this case the eggs hatched at 15° C., and the larvae entered the cocoon of the host, but by the 28th May they were still in

the first instar, though the temperature of the room had reached 19°. At temperatures between 15° C. and 18° C. some of the larvae will produce adults without entering a diapause, the proportion increasing with the rise in temperature.

Attempts to breed this species in large numbers in the laboratory have not been successful, as the normal hosts are not available all the year round and others such as *Hylemyia antiqua*, Mg., and *Musca domestica*, L., though readily attacked, are not suitable. *M. domestica* apparently develops too rapidly, and the parasite is unable to paralyse it. Whereas in the normal host the parasite is able to continue feeding at the first wound made by it, in the case of *M. domestica* the wound heals very quickly and the parasite has to make a fresh attack at each feed.

[SHCHELKANOVITZEV (Ya. P.).] Щелкановцев (Я. П.). **Severe Outbreak of *Tortrix viridana*, L., in the Governments of Voronezh and Orel in 1926.** [In Russian.]—*Défense des Plantes*, iv, no. 1, pp. 14–15. Leningrad, April 1927.

*Tortrix viridana*, L., occurred in unusual abundance on oak in Voronezh and Orel during June 1926, apparently as a result of particularly favourable weather conditions that occurred about the middle of May. *Tischeria complanella*, Hb., was also numerous on oak in the same forests. Other pests recorded in unusual abundance were *Hyponomeuta malinellus*, Zell. (apple moth) and *Loxostege (Phlyctaenodes) sticticalis*, L.

[STARK (V. N.).] Старк (В. Н.). **Development of *Myelophilus (Blastophagus) piniperda*, L., and *M. (B.) minor*, Hart., on Fir.** [In Russian.]—*Défense des Plantes*, iv, no. 1, pp. 15–19. Leningrad, April 1927.

During 1921 *Myelophilus piniperda*, L., and *M. minor*, Htg., were found to be infesting fir trees in the mixed stands of fir and pine in the Bryansk forests. The trees had been weakened by fire, which had not been sufficiently severe to have much effect on the more resistant pine trees. The firs were also attacked by *Ips typographus*, L., and *Polygraphus poligraphus*, L.

The development of *M. piniperda* and *M. minor* during the subsequent years has been studied. When given a choice of food-plants, they prefer pine, but in the absence of these trees, firs are attacked. The development in fir is slightly protracted, the greatest difference being during the pupal stage. The development of one generation on fir tends to increase the reproductive activities of the bark-beetles returning to pine, whereas those continuing to breed on fir eventually lose the power of reproduction [cf. *R.A.E.*, A, xv, 209].

[YAKHONTOV (V. V.).] Яхонтов (В. В.). **The Morphology of the various Stages of Development of *Ernestia consobrina*, Mg. (Diptera, Tachinidae).** [In Russian.]—*Défense des Plantes*, iv, no. 1, pp. 22–25, 14 figs., 1 ref. Leningrad, April 1927.

Owing to the importance of *Ernestia consobrina*, Mg., as a parasite of injurious Noctuids in Russia, all the various stages are described and illustrated.

[RODIONOV (Z. S.).] **Родионов (З. С.). Lucerne Pests in Azerbaijan.**  
[In Russian.]—*Défense des Plantes*, iv, no. 1, pp. 25–28, 2 figs.  
Leningrad, April 1927.

*Hypera (Phytonomus) variabilis*, Hbst., causes considerable injury to lucerne in Azerbaijan. Sprays of tobacco extract and soap or Paris green and lime have not given satisfactory results, the number of larvae killed amounting to 3–5 and 20–25 per cent. respectively. Under experimental conditions submersion in water destroyed the pupae, but this is not practical under field conditions as the cocoons are usually attached to small pieces of dry vegetation and therefore float, as they do also if not attached to anything.

*Salebria semirubella*, Scop., is not a very serious pest, especially as it disappears after the second mowing. Cutting the crop at definite periods in the development of the moth is apparently the best means of control. Spraying with Paris green is only effective if carried out before the larvae have completed their web-like covering; insecticides in dust form, such as calcium arsenite, are slightly more effective.

[RODIONOV (Z. S.).] **Родионов (З. С.). Pests of Cotton. Part I.**  
[In Russian.]—*Défense des Plantes*, iv, no. 1, pp. 28–59, 7 figs.,  
10 refs. Leningrad, April 1927.

In view of the serious losses caused by insect pests to cotton in Azerbaijan, the Experimental Entomological Station, inaugurated in the spring of 1926, has undertaken a study of the insects occurring in these fields. The Orthoptera and Lepidoptera are here dealt with, their bionomics and possible remedial measures being discussed. The species dealt with are *Gryllotalpa gryllotalpa*, L., *Gryllus desertus*, Pall., and *G. burdigalensis*, Latr. var. *cerisyi*, Serv.; locusts, the more important of which are *Calliptamus italicus*, L., *Thisoececrinus pterostichus*, F.-W., and *T. adspersus*, Redtb.; and *Heliothis obsoleta*, F., *Laphygma exigua*, Hb., and *Platyedra vilella*, Zell. The larvae of *H. obsoleta* are parasitised by *Microbracon (Habrobracon) simonovi*, Kok.; *Barylypa humeralis*, Brauns, *Amblyteles crispatorius*, L., *Tachina rustica*, Mg., *Cnephalia bucephala*, Mg., and *Muscina stabulans*, Fall., were reared from the pupae. A key is given to the genera of locusts occurring in the cotton fields.

[OSTAPETZ (A. P.).] **Остонец (А. П.). The "Nest" Method as applied to Control of Pests on a large Scale.** [In Russian.]—*Défense des Plantes*, iv, no. 1, pp. 86–88. Leningrad, April 1927.

The control of agricultural pests on a large scale is very difficult under existing conditions in Russia, and it is suggested that better results would be obtained by the application of what is called the "nest" method, i.e., restricting all activities to a definite area until it has been satisfactorily dealt with, and only then extending the work to a fresh centre. This method should be applicable to field and garden pests, and possibly to those of stored products.

[SHCHELKANOVITZEV (Ya. P.).] **Щелкановцев (Я. П.). Experiments for the Control of Pests of stored Products on the South-eastern Railways.** [In Russian.]—*Défense des Plantes*, iv, no. 1, pp. 161–162. Leningrad, April 1927.

The usual method of carbon bisulphide fumigation for the control of pests of stored products is not practicable in the majority of

store-houses along the railways, as they cannot be hermetically sealed. An alternative method in an empty storehouse is to raise the floor and thoroughly clean the space underneath. Where this cannot be done successful results have been obtained by drilling holes, about half-an-inch in diameter, in the floor-boards and pouring carbon bisulphide in them at the rate of about 1 lb. to 18 sq. ft. The holes are then sealed with clay. Under experimental conditions the storehouses were closed for 48 hours after treatment. Insects such as the granary weevil [*Calandra granaria*, L.] and the flour beetle [*Tenebrio molitor*, L.] that had been placed in small bags were all killed. This concentration does not, however, kill the immature stages of *T. molitor*, though all stages of *C. granaria* succumb.

[МИХАЙЛОВ-СЕНКЕВИЧ (Я. М.).] Михайлов-Сенкевич (Я. М.). **The Influence of lateral Winds and the Composition of the Insecticide on the Width of the Strip of Poison applied from Aeroplanes.** [*In Russian.*]—*Défense des Plantes*, iv, no. 1, pp. 163-166, 3 figs. Leningrad, April 1927.

If dusting is done from aeroplanes when a lateral wind is blowing, the strip of poison settling on the vegetation is considerably widened. The physical composition of the dust also affects its distribution. The coarser particles settle most directly and the minutest particles are carried the greatest distance, according to the direction of the wind. For practical purposes the effect of a lateral wind may be ignored, as the largest and smallest particles of the dust have the least insecticidal value, so that when the poison strip is widened under such conditions the applications should be made to overlap. The importance of the physical composition of the dust is pointed out, and it is suggested that this question could be studied satisfactorily under laboratory conditions.

[LYUBOMUDROV (I.).] Любомудров (И.). *Clinodiplosis equestris*, **Wagn., a new Pest of Winter Wheat for U.S.S.R.** [*In Russian.*]—*Défense des Plantes*, iv, no. 1, p. 176. Leningrad, April 1927.

This paper is almost identical with one previously noticed [*R.A.E.*, A, xv, 164].

[KIZERITZKIĖ (V.).] Кизерицкий (В.). *Liogryllus bimaculatus*, **DeG., as a Pest in the Transcaucasian Region.** [*In Russian.*]—*Défense des Plantes*, iv, no. 1, pp. 177-178, 6 refs. Leningrad, April 1927.

*Liogryllus bimaculatus*, DeG., causes considerable injury to cotton in Transcaucasia by attacking the stems near the ground. In some cases the plants, though weakened, may continue to grow, but considerable numbers are broken by the wind. This cricket also attacks the fruit of melons. The fact that it will readily eat moistened bread and melon pulp in captivity indicates that poison baits may be of value.

[POLOZHENTZEV (P. A.).] Положенцев (П. А.). **Pests of the Buzuluk Forest in the Samara Government.** [In Russian.]—5 pp. (Abstract in *Défense des Plantes*, iv, no. 1, p. 193. Leningrad, April 1927.)

*Monochamus galloprovincialis*, Ol., causes considerable injury to pines, even attacking healthy standing trees. The eggs are laid in holes prepared by the female on the trunks or exposed roots and hatch in a week. As many as 2,000 depressions containing eggs may occur in a square metre of bark. The larvae feed for about two weeks under the bark and then penetrate to the heart-wood. Felled trees, especially those lying in the shade, are most readily attacked. The adults are on the wing from June to the beginning of October. They ring-bark the branches in the crown of the tree, causing them to break. The best method of control is to lay out trap trees and later strip the bark from them.

[TAIROV (V. E.).] Таиров (В. Е.). **Protecting Vineyards from Phylloxera.** [In Russian.]—*Vestnik Vinodel. Ukrain.*, xxviii, no. 5, pp. 259–266. Odessa, May 1927.

The general importance of viticulture is outlined and the usual methods of controlling *Phylloxera* are reviewed. A law dated 26th June 1926 was passed in Russia providing for quarantine regulations, as well as a further study of *Phylloxera* in relation to resistant stocks. The use of the latter is considered the most satisfactory means of controlling the pest.

[SHEMBEL' (S. Yu.).] Шембель (С. Ю.). **Report (xiv) of the Astrakhan Station of Plant Protection from Pests for 1924. (From 1st October 1923 to 1st October 1924.)** [In Russian.]—28 pp. Astrakhan [1926]. (With a Summary in German.) [Recd. June 1927.]

Considerable injury was done by the Noctuid, *Arsilonche albovenosa*, Goeze, which destroyed over 4,000 acres of hay. *Arctia (Palparctia) spectabilis*, Tausch., was widely distributed, attacking hay, mustard and sunflowers. *Locusta migratoria*, L., occurred over an area of more than 5,500 acres, but the infestation was reduced to about 260 acres as a result of remedial measures. Good results were obtained against *Polyphylla alba*, Pall., with balls of cotton-wool soaked in carbon bisulphide and placed in the infested soil at a depth of 7 inches and about 5–7 inches apart. The same method was not effective against *Formica cinerea* var. *imitans*, Ruszky.

[BALAKHONOV (P. I.).] Балахонов (П. И.). **The more important Pests and Diseases of Agricultural Plants in the Astrakhan Region and their Control.** [In Russian.]—Astrakhansk. Stantz. Zashchit. Rast. ot Vredit. [Astrakhan Sta. Plant Protect.], Bibliot. Sel'sk. Khozyaina [Agriculturist's Library] no. 1, 62 pp., 20 figs. Astrakhan, 1926. [Recd. June 1927.]

The more common pests occurring in Astrakhan, including a number of noxious insects, are briefly discussed under their popular names, with recommendations for their control. Instructions are also given for the preparation and application of various sprays, dusts and poison baits.

[DEKENBAKH (K. N.).] Дженбах (К. Н.). **The Red Spider and its Control.** [In Russian.]—*Morbi Plantarum*, xiii, no. 3-4, pp. 81-88, 19 refs. Leningrad, 1924. [Recd. June 1927.]

*Tetranychus telarius*, L., is recorded on *Corylus avellana*, beans, and cucurbits, including cucumbers, in the Crimea. An oil emulsion made of 5 gals. hot water, 2½ lb. carbolic soap and 10 gals. kerosene, diluted in 150 gals. water, successfully controlled the pest on beans and cucurbits, though it caused considerable scorching. In the case of the cucurbits the affected leaves had to be cut, but the beans recovered and produced a good crop. Lime-sulphur, 1 : 40, gave good results under experimental conditions on pear trees in June and no scorching was noticed. For the control of the eggs and the individuals hiding in cracks on the trees, such places should be treated with boiled linseed oil.

[TROITZKII (N. N.).] Троицкий (Н. Н.). **On the Technique of studying Temperature as a biological Factor.** [In Russian.]—*Morbi Plantarum*, xiii, no. 3-4, pp. 88-97, 2 figs., 3 refs. Leningrad, 1924. [Recd. June 1927.]

The importance of temperature and humidity in relation to the activities of insect pests is pointed out and a modified polythermostat used for such studies is described. Experiments showed that the larval stage of *Phorbia (Hylemyia) brassicae*, Bch., extends from 10 to 49 days under average temperatures ranging from 35° C. [95° F.] down to 4° C. [39.2° F.]. Under the same temperature conditions the larval stage of *Oscinella (Oscinosoma) frit*, L., varies from 8 to over 62 days, and when the humidity is raised to 80 per cent. over some of the period, from 9 to over 74 days.

[DEKENBAKH (K. N.).] Дженбах (К. Н.). **Lime and Sulphur in American Practice for the Control of Plants.** [In Russian.]—*Morbi Plantarum*, xiii, no. 2, pp. 33-39, 16 refs. Leningrad, 1924.

**Experiments on the Application of New Methods of Controlling Pests in Crimean Orchards.** [In Russian.]—*Ibid*, xv, no. 3, pp. 136-141. 1926. [Recd. June 1927.]

The first paper describes the different forms of lime-sulphur in use in North America as sprays, with instructions for their preparation and application. In the second paper the advantages of boiled lime-sulphur concentrate [*R.A.E.*, A, iii, 418] over the mechanically mixed self-boiled preparation are pointed out. The spray is of particular value under local conditions as it can be distributed to the peasants in the concentrated form. *Cydia (Carpocapsa) pomonella*, L., and *Rhynchites bacchus*, L., which considerably reduce the value of the apple crop in the Crimea, were successfully controlled by the application of a combined spray of lead arsenate and lime-sulphur.

[KONSTANTINOVA (M. Ya.).] Константинова (М. Я.). **Experiments on the Study of individual Reaction of Barley to Injury by *Oscinella (Oscinosoma) frit*, L.** [In Russian.]—*Morbi Plantarum*, xv, no. 3, pp. 125-136, 3 refs. Leningrad, 1926. [Recd. June 1927.]

This is a detailed account of the effect of the attack of *Oscinella frit*, L., on different varieties of barley and of the reaction of the plants to the

injury at different periods of growth [cf. *R.A.E.*, A, xiv, 20]. The greatest injury is done when the plants are attacked at the time of the unrolling of the second leaf. The effect of the injury on the plant is dependent on its ability to form fresh stems. Injury to the main stem at 12 days old (third leaf stage) causes increased stalk formation, two or three stems appearing in the place of the original injured one. The formation of ears is comparable to that in the uninjured stem. When the injury is done later (12th–20th day), only one fresh stem is usually formed and this is retarded in growth. These observations explain the injurious effect of the attack of *O. frit* on plants in the south, where the conditions are often unfavourable for stem formation in the case of spring-sown crops. Lack of moisture is one of the main factors preventing the stem formation necessary for the plants to recover from the attack.

WATZL (O.). **Die Weizenhalmfliege.** [The Wheat Stem Fly.]—*Bundesanst. f. Pflanzenschutz*, Mitt. 171, 2 pp. Vienna, 1926. [Recd. July 1927.]

In Austria, *Chlorops taeniopus*, Mg., oviposits on the leaf-sheaths of cereals, preferably wheat, in May and June. The larvae feed in the stem and pupate near the uppermost joint. The flies of this generation emerge at the end of July or early in August and oviposit on any cereal plants that are available or on wild grasses, such as couch grass [*Agropyrum repens*]. In autumn they also lay their eggs in part on winter crops, preferably rye, and the larvae hibernate in the young plants, the injury becoming visible only at the end of winter or in spring. Pupation takes place in the stem and the resultant adults are those that oviposit in May and June in old plants. Summer crops should be sown as early as possible, while winter crops should be sown at the normal time and not at a late date. A trap-crop that is ploughed under before sowing the winter crop is useful. Self-sown cereal plants and couch grass should be destroyed.

WAHL (B.). **Bericht über die Tätigkeit der Bundesanstalt für Pflanzenschutz in Wien im Jahre 1925.** [Report on the Work of the Federal Institute for Plant Protection in Vienna in 1925.]—28 pp. Vienna, 1926. [Recd. July 1927.]

The insect pests observed in Austria in 1925 included *Chlorops [taeniopus]*, Mg., and *Oscinella (Oscinis) [frit]*, L., on cereals; the Geometrid, *Phasianella clathrata*, L., and *Tylenchus dipsaci*, Kühn, on clover; and *Bruchus (Bruchidius) obtectus*, Say, on beans. *Argyresthia ephippiella*, F., did considerable harm to cherries, and these trees were in one instance attacked by the oak sapwood beetle, *Scolytus (Eccoptogaster) intricatus*, Ratz. *Lecanium corni*, Bch., which was again very harmful to plum [*R.A.E.*, A, xiv, 189], was in one instance attacked by the Coccinellid, *Scymnus (Pullus) ferrugatus*, Moll.

Vine pests included *Byctiscus betulae*, L., *Clysia ambiguella*, Hb., *Polychrosis botrana*, Schiff., *Otiorrhynchus raucus*, F., *O. (Cryphiphorus) ligustici*, L., *Bothynoderes punctiventris*, Germ., *Tanymecus palliatus*, F., and the mite, *Eriophyes vitis*, Nal.

In experiments with insecticides, *Bruchus obtectus* and the larvae of *Tenebrio molitor*, L., were killed by carbon bisulphide at the concentration of 1 cc. per 20,000 cc. space in 24 hours at a temperature of 20°C.

[68° F.]. Further experiments with *T. molitor* showed a rapid decrease in the time necessary when the temperature was raised. Comparative tests on various Coleoptera showed that benzol evaporates more slowly and is less effective than carbon bisulphide.

TRAPPMANN (W.). **Prüfung von Raupenleimen im Winter 1926-27.** [Tests of Sticky Banding Materials in the Winter of 1926-27.]—*Nachrichtenbl. deutschen Pflanzenschutzdienst*, vii, no. 7, pp. 62-63. Berlin, July 1927.

The results of further tests with proprietary banding materials [R.A.E., A, xiv, 563] are tabulated. Some brands were much less effective than they had been in the preceding year.

SPEYER (W.). **Von der Bekämpfung des Apfelsaugers an der Niederelbe.** [Measures against the Apple Sucker on the Lower Elbe.]—*Nachrichtenbl. deutschen Pflanzenschutzdienst*, vii, no. 7, pp. 63-64, 2 refs. Berlin, July 1927.

While winter spraying against the eggs is the best measure against the apple-sucker [*Psylla mali*, Schm.] [R.A.E., A, xv, 228, etc.] any remaining infestation may be checked by spraying against the young larvae in spring. This was unsuccessful in April 1926, but in May 1927 good results were attained, possibly because the flower-stems in the blossom-clusters were more separated. Sprays containing nicotine proved superior to others.

WILLE (J.). **Das Schadaufreten des Moosknopfkäfers im Frühjahr 1927.** [The injurious Occurrence of *Atomaria linearis* in the Spring of 1927.]—*Nachrichtenbl. deutschen Pflanzenschutzdienst*, vii, no. 7, pp. 64-65, 8 refs. Berlin, July 1927.

A brief account is given of an outbreak of *Atomaria linearis*, Steph., in various parts of Germany in the spring of 1927. The mild winter and warm weather in March favoured the beetles, while the cold weather in April retarded the growth of the beet seedlings, leading to an attack of unusual severity. Most of the injury caused by the beetles is due to their attacking the seedlings just below ground, causing them to break, though feeding on the epidermis of the leaves also occurs.

FUCHS (G.). **Ueber die Schäden von *Chermes (Dreyfusia) nüsslini*, C.B., in Tannenbeständen in Baden.** [On the Injury by *C. nüsslini* in Stands of Silver Fir in Baden.]—*Zeitschr. Pflanzenkrankh.*, xxxvii, no. 7-8, pp. 193-201, 3 figs., 1 ref. Stuttgart, 1927.

The seriousness of the infestation of silver firs [*Abies*] in Baden by *Chermes nüsslini*, Börn., is ascribed to the drought and heat in 1911, which caused a sudden increase of the pest and weakened the trees. The needles and green bark of the shoots are deprived of chlorophyll; the former turn yellow and the latter turns brown and is thickened. The needles are curled and shortened, the growth of the main shoot is hindered, and as that of the side-shoots remains normal, malformation results. The dry soil and climate at Heidelberg seem responsible for

the considerable injury there. In former times deciduous trees were plentiful in the region, and it would be better if the silver firs were grown in mixed stands.

KOENIG (P.). **Ueber Baumwollschädlinge und ihre Bekämpfung.** [On Cotton Pests and their Control.]—*Zeitschr. Pflanzenkrankh.*, xxxvii, no. 7-8, pp. 215-223, 9 refs. Stuttgart, 1927.

This is a list of the insect pests of cotton in the United States and Egypt, with brief notes on injury they do and their control.

WILKE (S.). **Der Stand der Maiszünslerfrage.** [The European Corn Borer Question.]—*Arch. Natg.*, Abt. A, 1925, xci, no. 9, pp. 31-72, 14 figs., many refs. Berlin [1927].

This article reviews the whole problem of *Pyrausta nubilalis*, Hb. (European corn borer) and includes sketch maps showing its distribution in Germany, in Europe generally, and in North America, a detailed list of its distribution throughout the world, with its food-plants, and a table showing the times of flight in various countries. A general account is given of its bionomics and control, with a list of its insect parasites throughout the world.

KNOCH (V.). **Alte und neue Bekämpfungsmethoden gegen Insekten-schädlinge.** [New and old Control Methods against Insect Pests.]—*Intern. ent. Zeitschr.*, xxi, nos. 5-11, pp. 33-35, 45-48, 54-56, 61-62, 68-71, 75-78, 84-86, 1 ref. Guben, 1927.

This is a review of the known methods of control against insect pests.

MALENOTTI (E.). **L'acido cianidrico contro la cocciniglia grigia del pero.** [Hydrocyanic Acid Gas against the Grey Scale of Pear.]—*L'Italia agric.*, June 1927, reprint 10 pp., 8 figs. Piacenza, 1927.

*Epidiaspis piricola*, Del Guerc., is a serious pest of pear and apple in North Italy, where it is not attacked by parasites. As it occurs often on the twigs that bear flower-buds, its removal by scrubbing, etc., is difficult, and the use of contact insecticides injures the buds and fruits. The best time for dealing with it is in late autumn or winter, when the young adults occur. Following some preliminary experiments in the fumigation of pear and apple with hydrocyanic acid gas in 1925, further work was done by the Sansone method of fumigating several trees under one tent [*R.A.E.*, A, xiv, 569; xv, 115], with the following modifications introduced by Sansone:—A sodium cyanide of very pure quality is made up into cakes, each about the size and shape of an egg and weighing 30 gms. [about 1 oz.], and the requisite quantity is placed in a paper bag. The mixture is then effected, without any special generator, the bag being immersed in a bucket containing the solution of sulphuric acid. The bag postpones the chemical action, enabling the operator to withdraw, and the slow action (taking about 10 minutes) obviates splashes of acid, thus rendering a gas-filter unnecessary. It was found that fumigation for one hour at 15° C. [59° F.] using 16 gms.

sodium cyanide, 24 gms. sulphuric acid and 32 gms. water to 1 cubic metre space [equivalent to about 1 oz. sodium cyanide to 70 cu. ft.] is the best method for destroying *E. pivicola*.

LEONARDI (G.). **Elenco delle specie di insetti dannosi e loro parassiti ricordati in Italia fino all'anno 1911. Parte II. Fascicolo 4.** [Catalogue of Harmful Insects and their Parasites recorded in Italy to the Year 1911.]—*Ann. R. Ist. sup. agrar. Portici*, (3) ii, pp. 451–526. Portici, 1927.

Previous parts of this list have already been noticed [*R.A.E.*, A, xiv, 569, etc.]. This issue deals with the Hymenoptera and Diptera and contains appendices on various pests, including Nematodes, mites, and Myriapoda, and injurious insects of which the determination was uncertain.

SEYRIG (A.). **Etudes sur les Ichneumonides (Hymen.)**.—*Eos*, iii, no. 2, pp. 201–242, 12 figs. Madrid, 24th May 1927.

The species dealt with include *Habrocryptus defensor*, sp. n., and *Pimpla (Itoplectis) maculator*, F., from cocoons of *Tortrix viridana*, L., and *P. (Epiurus) malacosomae*, sp. n., and *Barylypa delictor*, Thunb., from cocoons of *Malacosoma neustria*, L., from Spain. *P. malacosomae* is itself parasitised by *P. (E.) roborator*, F., which in these observations was always a hyperparasite.

**The Sale of Diseased Plants Order of 1927.**—*Statutory Rules & Orders*, 1927, no. 350, 4 pp. London, 22nd April 1927.

This order, which applies to England and Wales, and came into force 25th April 1927, has the same provisions as the previous ones [*R.A.E.*, A, ix, 485 ; xi, 203] but also prohibits the sale of any plant that appears to have been seriously attacked by *Plesiocoris rugicollis*, Fall. (apple Capsid).

MASSEE (A. M.). **Field Experiments with Dormant Winter Washes.**—*Ann. Rept. East Malling Res. Sta. 1925*, xiii, pt. 2 (suppmt.), pp. 101–113, 1 ref. East Malling, Kent, March 1927. [Recd. June 1927.]

The greater part of the information contained in this paper on the toxicity of dinitro-o-cresol and its salts, together with other preparations, to insect eggs, has already been noticed [*R.A.E.*, A, xiv, 514].

GOODWIN (W.), MASSEE (A. M.) & LEPALLEY (R. H.). **Tar-distillate Washes. Their comparative Effectiveness, under different Conditions, on various Pests, and at increasing Concentrations.**—*Ann. Rept. East Malling Res. Sta. 1925*, xiii, pt. 2 (suppmt.), pp. 114–125, 1 graph, 1 ref. East Malling, Kent, March 1927. [Recd. June 1927.]

This paper has already been noticed from another source [*R.A.E.*, A, xiv, 642].

AMOS (J.), HATTON (R. G.), KNIGHT (R. C.) & MASSEE (A. M.). **Experiments in the Transmission of "Reversion" in Black Currants.**—*Ann. Rept. East Malling Res. Sta. 1925*, xiii, pt. 2 (suppmt.), pp. 126–150, 4 pls., 4 refs. East Malling, Kent, March 1927. [Recd. June 1927.]

The first part of this paper deals with experiments carried out by A. M. Massee to determine whether direct infection of normal plants with big-bud mites [*Eriophyes ribis*, Nal.] was followed by the development of the symptoms of reversion (a definite disease of black currants) and, if so, to what extent quantitative correlation existed. The various methods by means of which attempts were made to transfer living mites from one bud to another are discussed.

After successful artificial infestation with mites, 90 per cent. of the normal black currant bushes developed reversion sooner or later. In four cases, however, no reversion appeared, and there is no obvious explanation why these four bushes resisted the disease. No big-buds developed and no symptoms of reversion appeared in 35 out of 43 bushes acting as controls. Three other bushes showed reversion, though no obvious big-buds were produced. In one of them, however, another mite [*Phyllocoptes masseei*, Nal.], which does not form big-buds, was discovered, and experiments are in progress to ascertain whether there is any correlation between its attack and reversion. The remaining five bushes developed big-buds but showed no reversion. There is very little relation between the number of visible big-buds and the intensity of the accompanying reversion symptoms.

The rest of the paper deals with experiments in the transmission of reversion by other methods. Reversion appeared in 100 per cent. of previously normal individuals grafted to or inarched with reverted plants, the evidence being strong, but not conclusive, that transmission in these cases was independent of big-bud mites. It was not possible to induce reversion by metabolic disturbance, nor to transmit the disease by sap transfusion. The evidence obtained indicates that the disease is not regularly or easily transmitted by the pruning knife, nor has it been possible to demonstrate its transmission through the seed.

MASSEE (A. M.). **Observations on the Presence of Mites (*Eriophyes ribis*) upon Black Currant Bushes manifesting Reversion and Big-bud.**—*Ann. Rept. East Malling Res. Sta. 1925*, xiii, pt. 2 (suppmt.), pp. 151–153. East Malling, Kent, March 1927. [Recd. June 1927.]

Microscopical examination of all buds from five bushes showing extreme symptoms of reversion but, with one exception, very little big-bud, proved the presence of mites in apparently normal buds and the existence of big-buds free from mite infestation. In the case of the exception only one of the twelve apparent big-buds showed any signs of mite infestation, and since similar cases had occurred in other varieties of black currant, further investigations were made. Of 50 swollen buds of this type kept under observation, 44 developed normal leaves and flowers, and, though they were periodically examined, no migrating mites were discovered. The other six buds failed to develop normally and were found to contain mites. These spurious big-buds appear to be more or less common varietal characteristics, chiefly upon varieties of the Goliath group, and it would, therefore, have been a very serious matter if all the shoots showing big-buds on this variety had been automatically

pruned off as a sanitary measure [R.A.E., A, xiv, 52]. A number of shoots were selected from normal and reverted bushes on which no big-bud had been recorded, and out of 1,688 apparently normal buds examined, 74 contained living gall-mites. Although the majority of the infested buds were from shoots showing symptoms of reversion, some were from bushes that appeared normal. Freedom from big-bud is not, therefore, synonymous with freedom from mite infestation, and the French group of currants for which freedom from mites has from time to time been claimed also exhibits this phenomenon. Thus the presence or absence of mites cannot definitely be determined from manifestations of big-bud.

MASSEE (A. M.). **The Gall Mites of the Himalaya Berry and Raspberry.**  
 —Ann. Rept. East Malling Res. Sta. 1925, xiii, pt. 2 (suppmt.),  
 pp. 154–156, 1 pl. East Malling, Kent, March 1927. [Recd.  
 June 1927.]

The gall-mite found infesting Himalaya berry and raspberry [R.A.E., A, xi, 179] is *Eriophyes gracilis*, Nal. During the latter part of August or in September, according to the season, the mites migrate from the foliage and enter hibernation, which usually occurs under the bud scales, although the mites are occasionally found in the centre of the buds, in cracks or wounds on the stem or under the scaly bark. Up to the present they have not been detected in the soil. The colonies usually consist of five or six individuals, although, in rare instances, especially on raspberry, larger groups may be found. Although the mites do not appear to be active during the winter, some of the immature forms apparently continue to develop, since cast skins are frequently found under the bud scales. During the spring, usually in March or April, the mites become active and feed on the bud tissues for some considerable time before migrating to the open and scattering over the leaves of the plant (they usually drop upon the leaves below the bud to which they were attached). In the spring and summer they live and reproduce on the lower surface of the leaves, in the flowers, and, later on, in the developing fruits. Adult females are found in great numbers, but males are rarely seen. The damage caused to the foliage by the feeding of the mites is not very conspicuous, unless the attack is severe. In such cases the upper surface of the leaf becomes mottled and of a whitish appearance, and the midrib may even become constricted. The infested fruits become malformed, ripen when only half developed, and are usually of a dull reddish brown colour. The injury in Himalaya berry is more pronounced than in raspberry. Frequently the fruits of loganberry and wild blackberry are similarly damaged; whether a closely allied species of mite is responsible has not yet been proved.

In a small experiment carried out with the object of proving the correlation between the presence of mites and the manifestation of abnormal foliage in the food-plant, two healthy plants of Himalaya berry growing in the open were directly infested with mites from infected canes. Both plants produced abnormal foliage, but this result is not conclusive, as the experiment was on so small a scale and without control plants.

The gall-mites are very common on many varieties of raspberry during the summer months. They have been found on very young raspberry seedlings, many of which have malformed foliage, and the damage has in some cases been so severe that the plants are rendered useless.

MASSEE (A. M.). **Notes on Insects and other Pests in 1925.**—*Ann. Rept. East Malling Res. Sta. 1925*, xiii, pt. 2 (suppmt.), pp. 157–160. East Malling, Kent, March 1927. [Recd. June 1927.]

The common red spider, the correct name of which the author considers to be *Oligonychus ulmi*, Koch, was one of the most prevalent pests during the year. It attacked mainly young apple and plum trees, though pears and many other plants may be infested. On apple, the leaves are most frequently damaged, though in some cases of severe attack even developing fruits and young growth are affected. On badly infested trees the leaves change from a fresh green to a dull silvery colour. The mites usually live and feed in small webs attached to the lower surface of the leaves, but when very abundant they may occur on both surfaces and on the stems and trunk. They seem to be most numerous on apple during the latter part of June and July, when the tree should be making its maximum growth. The growth of plum trees, both in the nursery and plantations, was checked and the leaves dried up prematurely. Some varieties appeared to be more susceptible than others. Pears did not suffer to the same extent, although two plantations in the district were severely infested.

*Tetranychus telarius*, L., caused considerable damage to hops in some localities, the mites increasing very rapidly during August. Early in the month they migrate from the bines to the cones, from which they are not easily dislodged by spraying without causing damage. The cones become discoloured by the attack. In September the mites migrated to the soil, and were also found sheltering in cracks in the poles.

On fruit trees, as a rule, red spiders pass the winter in the egg stage, the eggs being deposited on the trunks, in cracks or wounds and around the bases of spurs. A series of definite experiments showed that a proprietary tar distillate spray was ineffective against these eggs on apple. In the spring the same plots were sprayed with a combined fungicide and insecticide wash just before the blossoms opened and again ten days later. On the plot sprayed with 100 gals. Bordeaux mixture (8:8:100) containing 4 lb. lead arsenate and 6 oz. nicotine, the infestation remained heavy, while on the plot sprayed with lime-sulphur (1:30) and similar quantities of lead arsenate and nicotine the red spiders were controlled to a very large extent. A second application of lime-sulphur was at the reduced strength of 1:60. On another plantation of apples, a spray of 3 lb. liver of sulphur and 5 lb. soft soap to 100 gals. water used after blossoming was of considerable value in controlling the mites. An unsuccessful attempt was made to eradicate them on plums by repeated spraying with 8 gals. flour paste to 100 gals. water.

*Hoplocampa testudinea*, Klug (apple sawfly) was troublesome in some districts, fully two-thirds of the crop being destroyed in one old and somewhat neglected plantation. *Otiorrhynchus picipes*, F. (clay-coloured weevil) damaged newly grafted apple trees, eating the leaf buds as soon as they opened and causing the graft to die out. Early in spring it appeared on currant bushes and was observed feeding on the bark of young apple trees. An arsenical spray completely checked the weevils, though it was not possible to determine whether it killed them or merely acted as a deterrent. *Euacanthus interruptus*, L. (hop frog hopper) was prevalent in some hop gardens in May, June and July. It was first reported about the middle of May, when it was in the immature stage. The insects were feeding on both surfaces of the leaf, and, in the early

part of the season, were generally found at the base of the bines. Later in the season they worked their way up the shoots and fed on the new succulent growths. They reach the adult stage about the middle of July. Continued spraying with a nicotine-soap solution proved of very little value against these Jassids, the failure probably being due to their habit of quick jumping. Since they fall to the ground as soon as they are disturbed, the method of jarring them off the bines on to tarred sacking proved successful, but cannot be considered entirely satisfactory in view of the time and labour required.

MASSEE (A. M.). **Entomology. Programme of Research with brief Progress Reports.**—*Ann. Rept. East Malling Res. Sta. 1926*, xiv, pt. 1 (general), pp. 63–65. East Malling, Kent, May 1927.

Experiments on the toxicity of a proprietary brand of tar distillate together with a similar wash of known composition upon the eggs of the vapourer moth [*Notolophus antiquus*, L.] under laboratory conditions [*R.A.E.*, A, xiv, 643] were repeated. At strengths varying from 5–10 per cent. both washes killed 92–96 per cent. of the eggs. A new proprietary tar distillate and a carbolineum of known composition gave negative results against red spider. Further field tests were made of some new washes [*R.A.E.*, A, xiv, 514]. On sprayed trees the percentage of mortality in eggs of the hop-damson aphid [*Phorodon humuli*, Schr.] varied from 58 to 75. On the unsprayed trees 74 per cent. of the eggs hatched compared with 55 per cent. in the previous year.

Some of the progeny of apple stock known to be highly resistant to *Aphis pomi*, DeG., maintained the same degree of resistance, but others did not. Some stocks of mazzard cherry (*Prunus avium*) resistant to *Myzus cerasi*, F. (cherry aphid) maintained their resistance throughout the year, while in others, which had appeared highly resistant for five years, a marked degree of susceptibility appeared. A number of new apple seedlings resulting from the crossing of Northern Spy with various other strains have shown almost as great a degree of resistance to the woolly aphid [*Eriosoma lanigerum*, Hausm.] as Northern Spy itself [*cf. R.A.E.*, A, xiv, 403].

Experiments against the apple sawfly [*Hoplocampa testudinea*, Klug] in the field have shown that it may be possible to achieve a large measure of control with an arsenical spray, success apparently depending upon the time of application and the weather conditions during spraying. In one orchard, 80 per cent. of the apples on selected trees were found to be attacked by sawfly larvae. Larvae have not yet been detected in the soil.

MILES (H. W.). **The Control of Wireworms.**—*Agric. Progress*, iv, reprint, 5 pp., 4 refs. London, 1927.

The greater part of this information on the use of baits in conjunction with calcium cyanide for the control of wireworms has already been noticed from another source [*R.A.E.*, A, xiv, 185]. In experiments carried out to test the possibility of baiting newly ploughed grassland before the sods have decayed too few wireworms were attracted by the various baits to make this a practicable measure within a month after ploughing. In these trials leather-jackets [*Tipula*] were attracted to all the baits, especially to the bran mixtures. In April 1926 a field that had been broken up during the previous autumn was drilled with wheat

set 2-3 ins. deep in rows 3 ft. apart. Examination about a month later showed that 82.2 per cent. of the wireworms present had been attracted to the bait, which indicates that under ordinary field conditions the use of baits in conjunction with soil insecticides is justifiable.

Three weeks after wheat had been sown between rows of strawberry plants known to be infested with wireworms, examination of various samples showed that 89 out of 109 wireworms found were in the bait, the remaining 20 being in the plants and interspaces. Calcium cyanide applied immediately to the rows of bait at a depth of 4 ins. killed 93 per cent. of the wireworms in two days, thus indicating the adaptability of this method to use with growing crops.

RENNIE (J.). **Crane Fly Grub and the Oat Crop.**—*N. Scotland Coll. Agric.*, Bull. 32, 14 pp., 1 pl., 4 refs. Aberdeen, 1927.

The bulk of this information on crane-flies as pests of oats in the north of Scotland, where the principal species concerned are *Tipula paludosa*, Mg., *T. oleracea*, L., and *Pachyrhina lineata*, Scop. (*histrion*, F.), and the methods of controlling them, is taken from papers previously noticed [*R.A.E.*, A, v, 361 ; ix, 576 ; xiv, 31 ; xv, 8].

A summary is given of the means employed by farmers as stated in replies to an enquiry ; these are mainly cultural measures [*cf. R.A.E.*, A, xiv, 463].

RENNIE (J.). **Acarine Disease in Hive Bees : Its Cause, Nature and Control.**—*N. Scotland Coll. Agric.*, Bull. 33, 34 pp., 5 pls., 2 figs. Aberdeen, 1927. Price 1s.

This detailed account of acarine disease in bees caused by *Acarapis woodi*, Rennie, is a revision of one previously noticed [*R.A.E.*, A, xii, 143]. A crawler trap, which has been devised with a view to limiting possible infection from crawling bees, is described. It consists of a rectangular box that stands in front of the alighting board. From the top of the box curved metal plates slope down to a median longitudinal slot leading into the trap. The crawlers leaving the entrance board of the hive descend into the trap, which has a sliding glass front by means of which it may be cleared and any bees capable of flight released. The floor stands on short supports and is sloped and perforated to release rain-water. Crawlers captured in the trap should be killed and burnt. The treatments advised for diseased stocks are recapitulated [*R.A.E.*, A, xii, 371]. In cases where the percentage of infested bees does not appear to be more than 30, where there are sufficient healthy bees to maintain the colony, and where the queen is vigorous enough to replace the incapacitated bees in time for the honey flow, a mixture of 1 part each of chloropicrin and camphor to 12 parts of methyl salicylate may be used. The hive should be opened and 5 drops of the mixture should be dropped from a pipette on to some porous material, such as birch bark or pumice, which is then placed on the frames below the covering quilt and the hive closed. This treatment should be repeated at intervals of two days for some weeks. During the winter the bees should not as a rule be disturbed, but the treatment may be repeated on fine days when natural flying is observed, and again in spring, until the honey flow comes on. The dose recommended is approximately 0.1 cc. This will not cause more than temporary irritation among the bees and allows a margin of safety. Since it is believed that the attraction of the mite

to the spiracles of the bee is chemotropic, it is suggested that an aromatic substance such as methyl salicylate or oil of winter green, introduced into the hive in the method described above and renewed regularly as the odour seems to fade, may serve to counteract the chemotropic function of the spiracles. The author is convinced that intensive infestations are responsible for the malignant features of acarine disease in Great Britain, and that, so long as trading in bee stocks continues without discrimination as to whether mite infestation is present or not, the disease can never be eradicated in the country.

JOHN (O.). **La position systématique de *Phloeothrips oleae*, Costa (Thysanoptera).**—*Bull. & Ann. Soc. ent. Belg.*, lxvii, pt. 3-4, pp. 121-122, 1 ref. Brussels, 30th April 1927.

From an examination of specimens of *Phloeothrips oleae*, Costa, the author considers that this species should be placed in the genus *Liothrips* and that *L. novaki*, Karny, described from Dalmatia without indication of food-plant, is a synonym of it.

ROLET (A.). **La destruction du ver de l'olive.**—*Vie agric. & rur.*, xxx, no. 22, pp. 346-349. Paris, 29th May 1927.

This is a review of the various methods of controlling *Dacus* [oleae, Gmel.] by baits and bait-sprays, with notes on its natural enemies.

VERGUIN (J.). **La mouche des cerises (*Rhagoletis cerasi*, L.).**—*Pubns. agric. Cie. Chemins de fer P.L.M.*, Bull. 28, 10 pp. Paris, 1927.

VERGUIN (J.). **La mouche des cerises.**—*Vie agric. & rur.*, xxx, no. 24, pp. 380-381. Paris, 12th June 1927.

Most of the information contained in these papers has already been noticed from another source [*R.A.E.*, A, xv, 103]. The importance of destroying wild cherries, *Berberis vulgaris* and *Lonicera*, which may serve as alternative food-plants for *Rhagoletis cerasi*, L., is pointed out.

LIENHART (R.). **Sur la présence, aux environs de Nancy, du Coléoptère longicorne *Criocephalus rusticus* Linné.**—*C.R. Soc. Biol.*, xcvi, no. 14, p. 1161. Paris, 6th May 1927.

*Criocephalus rusticus*, L., is recorded from the vicinity of Nancy. The author considers that the northern range of this Longicorn is not so much a question of temperature as of the distribution of the genus *Pinus*, which is its only food-plant; and that wherever pines can grow this beetle may be found.

BONNAMOUR (S.) & GAUTIER (C.). **Nouveau gîte pour l'hibernation de *Tingis pyri*, F. (Hem. Tingitidae).**—*Bull. Soc. ent. France*, 1927, no. 7, pp. 118-119. Paris, 1927.

Further observations on *Stephanitis* (*Tingis*) *pyri*, F. [*R.A.E.*, A, xiii, 296; xv, 204] show that the adults may hibernate under bark, under strawberry leaves, or under dead leaves, particularly in the shelter of walls. Low-growing plants with leaves that persist throughout the winter should, therefore, be removed from the vicinity of infested pear and apple trees, and all dead leaves should be collected and burnt.

FEYTAUD (J.). **La nicotine.**—*Rev. Zool. agric. & app.*, xxvi, no. 2, pp. 17–30, 3 refs. Bordeaux, February 1927. [Recd. May 1927.]

An account is given of the history of nicotine in France from the time of the introduction of tobacco. The forms of it that are on the market there at the present day are discussed [*R.A.E.*, A, xiii, 93]. During the last 25 years, since its use as an insecticide has become general, the demand has always exceeded the supply. From 1927, however, an effort will be made by the Government to meet the needs of agriculturists by increasing the manufacture and purchasing foreign products.

WORSLEY (R. R. LE GEY). **A Rapid and Accurate Means of estimating Nicotine in Tobacco and Tobacco Extracts.**—*Minist. Agric., Egypt*, Bull. 73, 5 pp. Cairo, 1927.

Various methods of estimating the nicotine content of tobacco extracts, etc., depend on the liberation of free nicotine base by means of caustic soda, and the subsequent removal of this nicotine by means of a solvent (ether, etc.) ; the nicotine is then determined by titration with standard acid. In warm climates ether cannot be used ; petroleum ether of a boiling point range of 50–60° C. (122–140° F.) or higher, gives accurate results. Any ammonia present is best removed by drawing a stream of air through the solvent, prior to titration ; “binding” the ammonia with gypsum proves useless, unless only a very little ammonia is present. By this method, the details of which are described, results accurate to 0.005 per cent. can be readily obtained in a minimum of time.

VAYSSIÈRE (P.). **Sur quelques Coccidae (Hem.) de l’Afrique du Nord.**—*Bull. Soc. ent. France*, 1927, no. 6, pp. 107–111, 3 figs. Paris, 1927.

The new Coccids described are *Monophlebus suedae* var. *halocnemae* on *Halocnemum strobilaceum*, *Cerococcus dumonti* on *Helianthemum* spp., and *Phenacoccus seurati* on *Cystanche violacea* from Tunisia ; and *P. subericola* on *Quercus suber* from Morocco.

BALACHOWSKY (A.). **Sur la présence en Algérie du *Sycosoter lavagnei* Picard et Licht. (Hym. Braconidae), parasite externe de l’*Hypoborus ficus* Er. (Coleop. Scolytidae).**—*Bull. Soc. Hist. nat. Afr. N.*, xvii, no. 9, pp. 263–264, 3 refs. Algiers, 1926. [Recd. June 1927.]

The Braconid, *Sycosoter lavagnei*, Pic. & Licht., which has previously been recorded only from the south of France [*R.A.E.*, A, vi, 328], was reared from *Hypoborus ficus*, Er., in fig in Algiers. Another Scolytid, *Cryphalus* (*Hypothenemus*) *ehlersi*, Eichh., is also found in fig in North Africa, frequently in association with *H. ficus*.

HARGREAVES (E.). **Sierra Leone : The Locust, *Zonocerus variegatus*, L.**—*Internat. Rev. Sci. & Pract. Agric.*, xviii, no. 4, pp. T247–T249. Rome, May 1927.

Immature forms of *Zonocerus variegatus*, L., were first observed at the end of September. The first oviposition probably occurs in January. The young locusts showed a special preference for a euphorbiaceous plant, *Alchornea cordifolia*, and for the weed, *Ageratum conyzoides*, which

latter can be used as a trap. *Z. variegatus* is particularly free from natural enemies and poultry will not eat it. The immature locusts congregate on the tips of high-growing plants in the evening and early morning, when they can be knocked off into buckets containing an inch or two of water. Tapering sticks inserted on an incline among low-growing crops at intervals of about 9 ft. with about 4 ft. showing above ground facilitate collection. A poison bait consisting of 1 bushel sawdust, 1 lb. Paris green, 2 lb. salt, and 5 quarts water proved successful on a large scale, its full effect being seen three days after application. It should be scattered thinly at the rate of 1 bushel to 2 acres. It is probable that some locusts may be killed by feeding on others that have been poisoned. As regards the infestation of *Citrus* trees (of which lemon is preferred) the few immature locusts remaining after treatment were successfully dealt with by spraying with lead arsenate.

CLOUSTON (D.). **Review of Agricultural Operations in India 1925-26.**—8vo, viii+152 pp., 10 pls. Calcutta, Govt. India Central Pubn. Br., 1927. Price 4s. 3d.

Most of the information concerning insects contained in this report on agriculture in India during 1925-26 has already been noticed from more extensive papers [*R.A.E.*, A, xv, 172, 199, 356, etc.].

In the United Provinces the pink bollworm [*Platyedra gossypiella*, Saund.] causes a loss of 20-40 per cent. of the cotton crop. In an isolated area sown with seed that had been subjected to 140° F. of dry heat, there was little sign of damage by this caterpillar and the cotton produced was of superior quality.

MILNE (D.). **Entomology.**—*Rept. Dept. Agric. Punjab, 1925-26*, pt. 1, pp. 49-54. Lahore, 1927.

A new species of *Earias* was found feeding on wild plants of the genus *Corchorus*. Life-history studies showed that *Sida cordifolia* and hollyhock are alternate food-plants of the spotted bollworms, *Earias insulana*, Boisd., and *Earias fabia*, Stoll, and that the latter, under field conditions, appears to prefer *Hibiscus esculentus* to cotton. The pink bollworm [*Platyedra gossypiella*, Saund.] has been found to be a far more important pest in the extreme south-east of the Province than elsewhere. The Indian Central Cotton Committee is contributing £1,100 a year to the Punjab Government for a detailed study of this pest. An examination of cotton sticks from 32 districts showed that the attack of the cotton borer [*Sphenoptera gossypii*, Kerr.] was stronger on desi than on American cottons. Studies are being made of *Myllocerus undecimpustulatus* var. *maculosus*, Desbr. (cotton white weevil).

Damage done to sugar-cane, *Sorghum* and maize by moth-borers [*R.A.E.*, A, xiv, 90, 423] ranged between 15 and 54 per cent. Laboratory and field experiments on burying the cane stubbles showed that no larvae survived even when buried only three inches under ground. Rice was attacked by the rice stem-borer (*Schoenobius* sp.). Light traps were used with effective results against hairy caterpillars (*Amsacta* sp.), which do extensive damage to maize, *Sorghum*, sunn hemp [*Crotalaria juncea*], etc., about 111,000 moths being captured with 180 lanterns used for 12 nights on 900 acres. Calcium cyanide was found effective in

fumigation against *Trogoderma* sp. in stored wheat. Pests of fruit included the mango hopper [*Idiocerus*], mealybugs and *Phyllocnistis citrella*, Staint. (citrus leaf-miner).

LEEFMANS (S.). **Schadelijke insecten aan** [Injurious Insects on] *Pandanus*: *Agestrata orichalcea* L. (Col. Cetoninae) en *Acara morosella* Wlk. (Lep. Pyralidae).—*Korte Meded. Inst. Plantenziekten*, no. 4, 13 pp., 5 pls. Buitenzorg, 1927. (With a Summary in English.)

*Pandanus* spp. (screw-palms) are of considerable economic importance in Java, as the leaves are used for the manufacture of hats and other articles, which are exported on a large scale. The palms are attacked by a Cetoniid beetle, *Agestrata orichalcea*, L., and by a Pyralid moth, *Acara morosella*, Wlk. The former is sometimes seen flying in the sunshine, but is usually found on its food-plant. The large larva lives in the decaying heart of the palm, which is entirely destroyed. The larvae and pupae are also found in holes in the trunk just under the basal leaves. In a single case the beetle was bred; the egg-stage lasted 13–14 days; the larval stage 303; the pupal stage 24; and the resting stage of the adult before emergence 22. If care is taken to find and destroy the larvae, the beetle can probably be controlled, as the time of development is so long. In a small experimental plot of *Pandanus* some varieties of *P. tectorius* were not attacked during a period of two years. It has been supposed that the larva of *A. orichalcea* is the exclusive food of the Scoliid wasp, *Scolia* (*Triscolia*) *rubiginosa*, F., but the latter has several times been bred by the author experimentally on the larva of the Dynastid, *Xylotrupes gideon*, L.

The Pyralid, *Acara morosella*, has not previously been recorded as a pest of *Pandanus*. The larva bores in the shoots without appearing to do much harm. It pupates in a cocoon. Only the length of the pupal stage (17–22 days) is known. The collection and destruction of the larvae are advised. In the experimental plot some varieties of *Pandanus* were not attacked.

DE FLACOURT (E. M.). **Le stick-lac au Cambodge**.—*Bull. écon. Indochine*, no. 184, pp. 115–126, 2 pls., 1 map. Hanoi, 1927.

An account is given of the cultivation of lac, produced by *Laccifer* (*Tachardia*) *lacca*, as practised in Cambodia. The production is much hindered by the work of the Noctuid, *Eublemma amabilis*, the larva of which constructs a gallery in the lac, at the extreme end of which it pupates, after having pierced a small hole in the periphery of the lac, through which the adult eventually emerges. Injury is also caused by the attacks of numerous ants, including a rather large black species, which carries off the lac insects before they have formed their protective covering, and is so active that whole trees of which the branches and twigs were covered with young colonies of *L. lacca* have been completely cleared in a few days. A brown ant, which constructs nests like large black balls at the tops of trees and has a characteristic odour, attacks the lac insects at all stages, devouring the young ones and enveloping those covered with lac with a covering of earth, which eventually stifles them. Two smaller species of ant, one red and very active and the other chestnut-coloured, are injurious when present in great numbers

during the first two months of the life of the Coccids, before the protective covering is made. A large red ant is rather beneficial than otherwise, as no damage is done to the lac insects and other ants are driven away by its presence on the trees. Small rodents, such as squirrels and rats, attack both the lac and the Coccids before they have reached maturity. It is suggested that light traps should be used to capture as many adults of *E. amabilis* as possible, that small bundles of rice straw sprayed with a sugar solution and placed at the foot of trees would attract numbers of ants, which could then be burnt, and that if the ground and the trees are kept clean rodents will not be much trouble, while traps can be laid for any that appear.

YOKOHAMA (K.). **Experiments on the Resistance of *Dermestes coarctatus* Harold and *Tribolium ferrugineum* Fabricius to abnormally high Temperature.**—*Bull. Imp. Seric. Expt. Sta. Japan*, ii, no. 3, pp. 103–117, 3 refs., 2 charts. Tokyo, February 1927.

The results of numerous experiments in which the different stages of *Dermestes coarctatus*, Hld., were exposed to various temperatures for various periods of time are detailed. The pupae proved the most susceptible to dry heat [*cf. R.A.E.*, A, ii, 702], while the larvae offered the strongest resistance to it. A temperature of 56–58° C. [133–136° F.] proved fatal to the adults and larvae in 15 minutes, the pupae all dying after 10 minutes. Confinement for one hour at a temperature of 50° C. [122° F.] killed all stages. The male of *D. coarctatus* shows a slightly smaller resistance than the female.

*Tribolium castaneum*, Hbst. (*ferrugineum*, F.), of which only the adults were present, offered a stronger resistance at the lower temperatures, but while confinement for 10 minutes at a temperature of 55° C. [131° F.] killed only 40 per cent. as compared with 88 per cent. of *D. coarctatus*, a 15-minute exposure to the same temperature killed 100 per cent. of both.

The author considers that in practical work these insects may be controlled by exposure to a temperature of 50° C. [122° F.] for one or two hours.

MORI (S.). **Morphological and Physiological Studies of the Respiratory System in *Bombyx mori* L. On the Closing Apparatus of the Spiracle.**—*Bull. Imp. Seric. Expt. Sta. Japan*, ii, no. 3, pp. 119–133, 2 pls., 2 figs., 20 refs. Tokyo, February 1927.

The contents of this paper, which deals with all stages but particularly the larva, is indicated by its title.

UYE (T.). **The Life-history of *Harmolita phyllostachitis*.** [*In Japanese.*]—*Insect World*, xxxi, no. 4, pp. 185–191. Gifu, June 1927.

The Chalcid, *Harmolita phyllostachitis*, Gah., oviposits on the young branches of a bamboo, *Phyllostachys bambusoides*, and the larvae feed inside the stalks, where pupation takes place in June, the adults appearing through the tissues from the end of June to the middle of July. There is one generation a year, the winter being passed in the larval stage. The larvae are parasitised by *Phaenacra* sp.

TANAKA (K.). On *Drymonia manleyi*, Leech. [In Japanese.]—*Insect World*, xxxi, no. 7, pp. 218–225, 4 pls. Gifu, 1927.

The gregarious larvae of the Notodontid, *Drymonia manleyi*, Leech, cause serious damage by eating the leaves of *Quercus glandulifera*, *Q. serrata*, *Q. dentata* and *Q. myrsinaefolia*. There is one generation a year, the winter being passed in the egg stage. The eggs, which are laid in masses on the plants with an average of 111 in each mass, hatch at the end of April. The larvae pupate on the lower parts of the tree in June, the moths appearing at the beginning of November. Collecting the pupae and eggs, burning the young larvae and spraying the older ones with derris and soap solutions are recommended as control measures.

KANENO (K.). Studies on a New Pest of *Arctium lappa*, *Scepticus insularis*, Roel. [In Japanese.]—*Jl. Plant. Prot.*, xiv, pp. 399–403. Tokyo, July 1927.

The weevil, *Scepticus insularis*, Roel., has attacked *Arctium lappa* for several years in the Oita prefecture. There is one generation a year, and the winter is passed in the adult stage in the soil. The adults feed on the young leaves and are also known to attack various species of Cucurbitaceae and other Compositae. The eggs are laid singly in the soil from the middle of April to the end of July, and hatch in 20 days. The larvae feed on the roots of the plant; they mature in 50 to 60 days and pupate in the soil, the adults emerging about 13 days later. Insecticides have not proved very effective, but collecting the weevils and crop rotation are recommended.

JEWELL (W. R.) & LEVICK (G. T.). Report to the Director of Agriculture on an Investigation to determine a Chemical Method of removing Rutherglen Bug (*Nysius vinitor*, Berg.) Marks prior to Canning. —*Jl. Dept. Agric. Victoria*, xxv, pt. 4, pp. 238–241. Melbourne, April 1927.

The damage caused to peaches by the Rutherglen bug (*Nysius vinitor*, Berg.) takes the form of brown marks clearly visible on peaches that have been badly damaged, but not noticeable on those slightly affected until after the removal of the skin. Though the mark does not affect the wholesomeness of the fruit and microscopic examination showed that the cell walls had not been ruptured, some alteration in texture apparently accompanies the discoloration, as badly marked peaches exhibit a roughened, tough exterior after the removal of the skin. There is no definite evidence that the bug does not inject into the peach some substance that aids discoloration, though this may be due solely to oxidation following the puncture of the skin.

After numerous experiments with various materials, a brief review of which is given, it was found that the marks and altered tissue could be removed by immersion for a second or, if necessary, a third time in the 3 per cent. caustic soda solution used for the ordinary skinning bath, without any deleterious effect on the peaches.

VEITCH (R.). Report of the Chief Entomologist.—*Queensland: Ann. Rept. Dept. Agric. & Stock 1925–26*, pp. 135–138. Brisbane, 1926. [Recd. June 1927.]

The chief pest of bananas in Queensland is *Cosmopolites sordidus*, Germ. (banana weevil borer) [*R.A.E.*, A, xiv, 128]; further colonies of

the predacious Histerid, *Plaesus javanus*, Er., from Java, were liberated in April and June 1926. Pests attacking the fruit of bananas included *Anaphothrips signipennis*, Bagn. (banana thrips); *Dacus ferrugineus*, F. (*Chaetodacus tryoni*, Frogg.) and another species of fruit-fly; a Coreid, *Dasynus lutescens*, Dist. (banana spotting bug), which caused considerable damage in one district and also attacked *Citrus*; and two Noctuids, *Tiracola plagiata*, Wlk., and a species of *Phytometra* (*Plusia*), which also attacks the foliage. Another Noctuid, *Prodenia litura*, F., is a minor pest of the foliage.

Deciduous fruits were also attacked by *D. ferrugineus*, which caused serious losses throughout the State. Much benefit has been derived in the control of *Eriosoma lanigerum*, Hausm. (woolly apple aphid) from the establishment of the parasite, *Aphelinus mali*, Hald.

Pests of *Citrus* included the Pentatomids, *Biprorulus bibax*, Bredd. (spiny orange bug) [*R.A.E.*, A, xiv, 331], a severe outbreak of which occurred in one district, *Oncoscelis sulciventris*, Stål (bronzy orange bug) and *Vitellus* sp.; the weevil, *Decilaus citriperda*, Tryon (citrus root borer); *Chrysomphalus* (*Aspidiotus*) *aurantii*, Mask. (red scale); *Chionaspis citri*, Comst.; and *Ceroplastes rubens*, Mask. (pink wax scale).

Miscellaneous pests included *Phthorimaea operculella*, Zell. (potato tuber moth), *Agromyza phaseoli*, Coq. (bean fly) and *Aulacophora olivieri*, Guér. (pumpkin beetle).

CUNNINGHAM (G. H.). "Natural Control" of Weeds and Insects by Fungi.—*N.Z. Jl. Agric.*, xxxiv, no. 4, pp. 244–251, 8 refs. Wellington, April 1927.

In the section of this paper dealing with fungi attacking insects it is stated that experience in New Zealand has shown that *Cephalosporium lecanii*, known for the past few years to attack *Saissetia oleae*, Bern., on *Citrus*, and *Sphaerostilbe aurantiicola* attacking *Chrysomphalus aurantii*, Mask. (citrus red scale) are unreliable as a means of control of these Coccids. While in one season they will practically exterminate the scale in one locality, they may in the following season fail to exercise any control. A phycomycete fungus, which in 1919 almost exterminated the larvae of the diamond-back moth, *Plutella maculipennis*, Curt., on a crop of swedes, was practically absent the following year, though the moth was plentiful. A list is given of other entomogenous fungi in New Zealand, all of which with the exception of *Cordyceps kirki* on *Deinacrida rugosa*, Buller, have already been noticed [*R.A.E.*, A, x, 542].

The author considers that in view of the scanty knowledge available regarding the balance between casual parasitism and extermination of a host by its parasite, control of insect pests by fungi must be regarded as possessing practically no value until conditions governing it can be worked out.

COPELLO (A.). *Biología del moscardon cazador de abejas* (*Mallophora ruficauda*, Wied.). [The Biology of the Fly preying on Bees].—*Argentina, Min. Agric.*, [Circ.] no. 699, 19 pp., 10 figs. Buenos Aires, June 1927.

The morphology of all stages of the Asilid fly, *Mallophora ruficauda*, Wied., is described, in addition to notes on its biology and control [*R.A.E.*, A, xii, 154; xv, 133].

HELLER (K. M.). [*Gonipterus gibberus*, **Boisd., in Argentina.**]—*Ent. Bl.*, xxiii, no. 2, pp. 89–90. Berlin, 30th June 1927.

Dr. E. E. Blanchard, writing from Argentina, states that the Curculionid, *Gonipterus gibberus*, Boisd., is a serious pest of *Eucalyptus* there, having probably been introduced with that tree. Marelli erroneously described it as *Dacnirotatus bruchi* [cf. *R.A.E.*, A, xiv, 434 ; xv, 237]. A similar pest, *G. scutellatus*, Gyll., is known in Tasmania and New Zealand.

SHEPHERD (F. R.) & HOWELL (W.). **Work in Connection with Insect and Fungus Pests and their Control.**—*Rept. Agric. Dept. St. Kitts-Nevis*, 1925–26, pp. 4–6 & 24. [Trinidad] 1927.

In St. Kitts the sugar-cane moth-borer [*Diatraea saccharalis*, F.] does not seem to be increasing [*R.A.E.*, A, xiv, 301]. *Alabama argillacea*, Hb., was not so prevalent as in the previous year and did no damage to the cotton plants, being controlled by insecticides. *Platyedra* (*Pectinophora*) *gossypiella*, Saund. (pink bollworm), which generally appears about the middle of June, slightly infests the earlier pickings of cotton, but it is possible with proper control measures to obtain large crops before any appreciable loss is sustained. Thorough cleaning up of the old cotton fields, the burning of the cotton and other food-plants such as okra [*Hibiscus esculentus*], the inspection of all fields before planting new crops and almost simultaneous planting in all parts of the Island are necessary if this pest is to be kept under control. An abstract of the legislation dealing with plant protection in force in the Presidency is given.

In Nevis *D. saccharalis* was more plentiful than it has been for some time past. The cotton crop planted in February 1925 was practically free from pests, but that planted in November was attacked by nearly all of them. *Alabama* sp. caused a great deal of damage in some localities during February and March. The leaf-blisther mite [*Eriophyes gossypii*, Banks], the cotton stainer [*Dysdercus andreae*, L.] and the cotton aphid [*Aphis gossypii*, Glov.] were also very numerous throughout the Island. Bolls were shed to a greater extent than ever, over 30 per cent. falling off in some cases. *P. gossypiella* caused only slight damage during the early part of the picking season, but later became very plentiful.

DAMPF (A.). **Contribución al conocimiento de la morfología de los primeros estados de *Hypoptya agavis* Blazquez (*chilodora* Dyar) (Lepidoptera, Familia Cossidae), plaga de los Magueyes en la Mesa Central de México.** [A Contribution to the Knowledge of the Morphology of the early Stages of *H. agavis*, a Pest of Agave in the Central Plateau of Mexico.]—*Estud. Oficina Defensa agric.*, no. 1, pp. 5–26, 19 pls., 14 refs. Tacubaya, D.F., March 1927. [Recd. July 1927.]

A very detailed description is given of the larva of the Cossid, *Hypoptya agavis*, Blazquez, which is a pest of agave in Mexico, though it has attracted little attention as the larvae are root-borers. There are also notes on the male genitalia. Caterpillars were found in the roots in October, but by the end of January they had made cocoons in the soil. In mid-March the cocoons contained pupae, and the adults emerged in mid-April. The eggs are laid in April and May on the roots

and stems of agave and hatch in 10–12 days, the larvae at once boring into the plants. Paradichlorobenzene should be used as a soil fumigant as recommended in a recent paper [*R.A.E.*, A, xv, 193].

**RUSSELL (R. C.). A Nematode discovered on Wheat in Saskatchewan.**—*Scient. Agric.*, vii, no. 10, pp. 385–386, 2 figs. Ottawa, June 1927.

Nematodes were discovered on the roots of seedling wheat in Saskatchewan and collections of them were made from June to August. At first, mature eggs were not present in the females; later in the season the gravid females died but remained attached by their heads to the wheat roots, forming silvery-white sacs easily visible to the naked eye. The eggs are protected by these sacs until conditions are favourable for their hatching. These Nematodes very closely resemble *Heterodera schachtii*, Schm., but there are certain differences and they may prove to be a new species. *H. schachtii* has not apparently been previously recorded in America, and it is not yet known whether the form found there is likely to prove a serious pest of wheat. It is, moreover, subject to great changes in temperature in Saskatchewan. Attempts to infect wheat and sugar-beet seedlings under greenhouse conditions from soil infested with the Nematodes have as yet given only negative results.

**ROSS (W. A.). The Residual Insecticidal Action of Lubricating Oil Sprays on the Pear Psylla.**—*Scient. Agric.*, vii, no. 10, p. 395. Ottawa, June 1927.

In view of the success obtained with 3 per cent. lubricating oil sprays against the pear psylla [*Psylla pyricola*, Först.] in Ontario [*R.A.E.*, A, xv, 36] experiments have been carried out to determine the residual action of these sprays. The four experiments recorded all demonstrate clearly that the spray, in addition to destroying large numbers of adults, has a very important residual action in that it prevents oviposition to a very large extent. This doubtless explains why lubricating oil sprays have given much more striking results in the control of *P. pyricola* than other contact insecticides, such as nicotine sulphate.

**EVANS (H. H.). Oil Sprays, their Use and Effectiveness in Control of Fruit-tree Leaf-roller, Oyster-shell Scale, and Blister Mite (under Interior Conditions of B.C.).**—*Brit. Columbia Dept. Agric.*, Circ. no. 68, 11 pp., 8 figs. Victoria, B.C., 1927.

Field tests carried out in British Columbia from 1923 to 1925 with various types of proprietary miscible oils and oil emulsions showed that sprays having a 7 per cent. oil content will give complete control of the oyster-shell scale [*Lepidosaphes ulmi*, L.] and the fruit-tree leaf-roller [*Tortrix argyrospila*, Wlk.], though oil-sprays proved inefficient in the control of the apple-leaf blister-mite [*Eriophyes pyri*, Pag.]. Although a combination with lime-sulphur, 1–15, testing 31° Beaumé, slightly lowers the efficiency of the spray against the two insects, such an application should be made if the mite occurs together with either or both of them. While lime-sulphur alone gave an average control of 92·5 per cent. against *E. pyri*, a combination of oil and lime-sulphur killed 80·5 per cent. of the blister mite, 85 per cent. of the leaf-roller and 95 per cent. of the scale. Only oils carrying a non-soap base were used in the combination tests.

If the results of the 1924 season, when some oils applied at a period when the temperature frequently fell below 32° F. produced up to 50 per cent. spur-bud injury, are compared with those of 1925, when the applications were made at temperatures ranging from 31 to 40° F. and the maximum injury caused was 5 per cent., it is evident that low temperatures following oil spray applications can cause severe injury even in the purely dormant state of apple trees. Dormant applications of oil sprays must therefore be made in the spring after danger of low temperatures is past and before the buds burst. Details of the cost of different types of sprays are given, and the relative merits of various types of proprietary oils are discussed. The spray now in general use in the Okanagan Valley of British Columbia is of the oil emulsion type, carrying 75 per cent. of oil in the concentrate, applied at the rate of 1 gal. stock to 10 gals. water.

**Directory of Field Activities of the Bureau of Entomology.**—*U.S. Dept. Agric.*, Misc. Circ. 80, 35 pp. Washington, D.C., December 1926. [Recd. June 1927.]

This pocket directory briefly enumerates the staff and activities of each individual laboratory, experiment station and office coming under the jurisdiction of the Bureau of Entomology, U.S. Department of Agriculture.

JEWETT (H. H.). **The Tobacco Flea-beetle.**—*Kentucky Agric. Expt. Sta.*, Bull. 266, pp. 51–69, 7 figs., 33 refs. Lexington, Ky., March 1926. [Recd. June 1927.]

*Epitrix parvula* (tobacco flea-beetle), which lives on a number of solanaceous plants but apparently prefers tobacco, attacks this plant in both the larval and adult stages and may cause considerable damage, the lower leaves being frequently killed by the beetles. Their life-history and habits are described and control measures are advocated [*R.A.E.*, A, xi, 570]. Land selected for a plant bed should be thoroughly burned or steamed in order to kill hibernating insects. After the bed has been prepared and sown, boards should be set up round it with soil banked round the outside, and a good grade of tobacco cotton should be stretched over the bed and fastened securely to the boards. If these are properly banked and the covering carefully sewed and fastened, very few beetles will gain entrance to the beds.

After the tobacco in the field has been cut, the stumps should be ploughed under or destroyed, as the suckers that spring from them furnish food for the adults until the time for hibernation.

BILSING (S. W.). **Studies on the Biology of the Pecan Nut Case Bearer** (*Acrobasis caryae*, Grote).—*Texas Agric. Expt. Sta.*, Bull. 347, 71 pp., 15 figs., 14 refs. College Station, Texas, April 1927.

The author discusses in great detail the biology of *Acrobasis caryae*, Grote (pecan nut case-bearer) in Texas, a briefer account of which has already been noticed [*R.A.E.*, A, xv, 70].

BRITTON (W. E.). **Twenty-sixth Report of the State Entomologist of Connecticut, 1926.**—*Connecticut Agric. Expt. Sta.*, Bull. 285, pp. 161–283, 16 pls., 11 figs. New Haven, Conn., February 1927.

Notes are given on the insect pests occurring during the year; some of those not recorded in recent reports [*R.A.E.*, A, xiv, 439, etc.], nor

dealt with in special papers include:—*Phylloxera vitifolii*, Fitch, *Pelidnota punctata*, L. (spotted grape-vine beetle) and *Lecanium corni*, Bch., on grape; *Agrotis* (*Noctua*) *unicolor*, Wlk., on grape buds and strawberry crowns; *Contarinia pyrivora*, Riley (pear midge); *Feltia subgothica*, Haw., a climbing cutworm that eats the buds of young apple trees; *Mineola indiginella*, Zell. (apple leaf-crumpler); *Oecanthus nigricornis*, Wlk., a tree cricket injuring apple and cherry twigs; *Tortrix* (*Archips*) *rosana*, L., on hickory; *Trioza diospyri*, Ashm., which, although not previously recorded in Connecticut, caused considerable injury to various species of persimmon [*Diospyros*] in one locality, curling the leaves and destroying the terminal buds; *Plutella maculipennis*, Curt., which was more prominent than usual on cabbage and cauliflower; *Phylctenia ferrugalis*, Hb. (greenhouse leaf-tyer), on beet in the open; *Phyllotreta armoraciae*, Koch (horse-radish flea-beetle); and *Listronotus latiusculus*, Boh. (parsley stalk weevil).

Shade and forest tree pests included:—*Kaliopfenusa ulmi*, Sund. (elm sawfly); *Diprion* (*Neodiprion*) *lecontei*, Fitch, attacking pitch pine [*Pinus rigida*] and other three-leaved pines; *Tortrix* (*Harmologa*) *fumiferana*, Clem. (spruce budworm); *Eulia pinatubana*, Kearf. (pine tube moth), occasionally causing partial defoliation of white pines [*Pinus strobus*]; *Hamamelistes spinosus*, Shim. (spiny witch-hazel gall aphid); *Colopha ulmicola*, Fitch, forming galls on elm; *Physokermes piceae*, Schr. (spruce scale); *Leucaspis japonica*, Ckll. (Japanese scale) on maple; *Elaphidion* (*Hypermallus*) *villosum*, F. (oak twig pruner); and *Chalepus* (*Odontota*) *dorsalis*, Thunbg. (locust leaf-miner).

Insects attacking ornamental plants included:—*Aulacaspis pentagona*, Targ., on lilac; *Stephanitis* (*Leptohyrsa*) *rhododendri*, Horv. (rhododendron lace bug); *Macronoctua onusta*, Grote (iris borer); *Julus hortensis*, Wood (garden millepede) and *Rhizoglyphus hyacinthi*, Banks, injuring tulip bulbs; and *Tarsonemus pallidus*, Banks (cyclamen mite), which attacks various plants including *Cyclamen*, *Chrysanthemum*, *Delphinium* and snapdragon [*Antirrhinum*], the young leaves being distorted and swollen.

BRITTON (W. E.) & ZAPPE (M. P.). **Inspection of Imported Nursery Stock.**—*Connecticut Agric. Expt. Sta.*, Bull. 285, pp. 189–191. New Haven, Conn., February 1927.

Pests found in nursery stock imported into Connecticut were *Acronycta* sp. and the woolly apple aphid [*Eriosoma lanigerum*, Hausm.] on apple, *Acronycta rumicis*, L., and *Nygmia phacorrhoea*, Don. (*Euproctis chrysorrhoea*, L.) on pear, and the rose scale [*Aulacaspis rosae*, Bch.] on rose, all from France; *Emphytus cinctus*, L., on rose and *Notolophus antiquus*, L., on rose and apple, from France and Holland; and *Rhabdophaga salicis*, Schr., on willows from Holland.

ASHWORTH (J. T.) & BRITTON (W. E.). **Gipsy Moth Work in Connecticut in 1926.**—*Connecticut Agric. Expt. Sta.*, Bull. 285, pp. 199–222, 2 pls., 2 maps. New Haven, Conn., February 1927.

A brief account is given of the work carried on against the gipsy moth [*Porthetria dispar*, L.] in Connecticut. Distribution of parasites was confined to one species, *Anastatus bifasciatus*, Boy., of which 400,000 individuals were liberated in different parts of the State in 1926. Maps

are given showing the present distribution of the moth in Connecticut and in the New England States, the barrier zone, which extends from the Canadian border to Long Island Sound, being indicated.

FRIEND (R. B.). **The Spruce Gall Aphid** (*Adelges abietis* L.) and its Control.—*Connecticut Agric. Expt. Sta.*, Bull. 285, pp. 223-228, 4 pls., 6 refs. New Haven, Conn., February 1927.

Experiments to determine the effectiveness of certain common insecticides in the control of *Chermes* (*Adelges*) *abietis*, L. (spruce gall aphid) were carried out in the spring of 1926. This Aphid forms galls at the bases of the twigs of spruce [*Picea*], killing them when, as in the majority of cases, the galls completely encircle them, and distorting the shape and retarding the growth of the tree. A mortality rate of 84.5 per cent. was observed in the examination of 852 gall-bearing twigs, but no case of killing a tree by galls alone has yet been recorded. Where trees are thickly planted the infestation is confined to the upper branches, while in more open planting all parts of the trees are attacked.

Galls found on Colorado blue spruce [*P. pungens*] and Sitka spruce [*P. sitchensis*] are due to *Chermes* (*Gilletia*) *cooleyi*, Gill., which makes a large gall at the tip of the twig, and the form attacking the Douglas fir [*Pseudotsuga taxifolia*] is *C. cooleyi* var. *coweni*, Gill., the control measures for both of these Aphids being identical with those employed for *C. abietis*.

Most of the information given in regard to the life-history of *C. abietis* has already been noticed [*R.A.E.*, A, xii, 421 ; xv, 189]. Although it has been stated that the gall is started by the hibernating female, it is certain that no gall is developed unless the young feed on the needles, the bases of which expand till they touch each other, forming a continuous bulbous swelling with the young Aphids enclosed in pockets inside. There is a very heavy mortality among hibernating nymphs, but the survival of one female at the base of a bud is sufficient to cause the formation of a gall in the following spring.

Field experiments were carried out in the first half of April on *P. excelsa* with insecticides that gave good results in laboratory tests. Excellent results were obtained with 40 per cent. nicotine sulphate, 1 : 500, with the addition of 0.5 per cent. soap to act as a spreader; fish-oil soap, 1 lb. in 8 U.S. gals. water; and two proprietary miscible oils at dilutions of 1 : 30 and 1 : 25. Carbolic acid emulsion, 1 : 20, gave indefinite results. If spruce mites [*Paratetranychus ununguis*, Jac.] are present on the trees, miscible oils are preferable as they control the mites as well as the Aphids. No galls developed on trees in the same block sprayed with lime-sulphur (32° Bé) 1 : 16 and 1 : 40, but this insecticide adheres to the foliage for weeks and may therefore be objectionable under some conditions. Large numbers of galls developed on unsprayed trees.

Trees may be kept free from galls for the season by one thorough spraying during the dormant season between the beginning of November and the middle of April, preferably in the first two weeks of April. If spraying is carried out later there is danger of damage to foliage and the insect is protected by waxy threads, while treatment is useless after the formation of the galls. The tips of the twigs must be thoroughly covered, particular attention being given to the lower surface.

STODDARD (E. M.) & ZAPPE (M. P.). **Further Reports on Spraying and Dusting of Apples.**—*Connecticut Agric. Expt. Sta.*, Bull. 285, pp. 228–234. New Haven, Conn., February 1927.

This is the seventh report made on spraying and dusting experiments in Connecticut [*R.A.E.*, A, xiv, 441, etc.], the orchard now under consideration having been in use since 1921. The materials used were a spray consisting of 6 lb. dry lime-sulphur, 3 lb. lead arsenate and 100 U.S. gals. water, a dust consisting of 90 parts sulphur and 10 parts lead arsenate (by weight), and a dust consisting of 85 parts sulphur to 15 parts lead arsenate, which is made by a new process producing a very fine dust, and is more economical in use than the coarser dust. Only four treatments were given in 1926, the pre-pink and last summer applications being omitted on all varieties as weather conditions rendered them unnecessary.

The tables show that on three of the four varieties of apples, four applications of spray or two of spray followed by two of dust gave a larger percentage of unblemished fruit (80.1 to 87.9) than four applications of dust or two of dust preceded and followed by one of spray (70.8 to 82.1). The summary of all the results indicates that four applications of spray are better than two of spray followed by two of dust, but if fungus injury, which was very slight on all the treated plots, is disregarded, the order is reversed. The authors consider, however, that the substitution of spraying for the last dust treatment would be necessary in a year of abundant rainfall in the latter part of the summer to control fungus pests. The most important insect pests were curculio [*Conotrachelus nemphar*, Hbst.], which was well controlled by all treatments, and Aphids, which did little damage except on one variety.

GARMAN (P.). **Work with the Oriental Peach Moth in 1926.**—*Connecticut Agric. Expt. Sta.*, Bull. 285, pp. 234–239, 1 pl. New Haven, Conn., February 1927.

Life-history studies of the oriental peach moth [*Cydia molesta*, Busck] in 1926 showed only three broods, there being no sign of a fourth as in the previous year [*R.A.E.*, A, xiv, 441]. The flight of the last brood in the field apparently extended from about 5th August to 25th September, reaching its maximum about 1st September. Eggs laid on quinces were parasitised by *Trichogramma minutum*, Riley, in August and September.

Experiments with 2 qt. bait pails containing 1 part molasses diluted with 20 parts water showed that while numbers of the moths were caught daily, they only represented a very small percentage of the total population of the orchard. The results showed no advantage from the use of pails as compared with control plots. No substantial increase in the number of sound fruit was obtained by various sprays that maintained a continuous coating on the fruit from June until late August, as the main part of the infestation seems to have come after 25th August, when much of the spray had disappeared.

As the larvae of *C. molesta* are not successfully poisoned by any insecticide in common use, studies were made of artificial foods upon which they might be induced to feed and develop, with a view to incorporating some poison with the one proving most acceptable. It was discovered that the larvae would feed on flour dough, but pure flour dough fermented too rapidly. Mixtures containing citric and malic acid were better, but even they became mouldy and probably caused

some of the difficulty encountered in carrying the larvae through a number of instars. Though the larvae did not develop naturally on any of the foods, in some cases they survived as long as three weeks on the artificial media, the most successful of which consisted of 50 gm. flour, 1 gm. citric acid, 1 gm. malic acid, 5 gm. dextrose, 5 gm. amygdalin and 38 cc. water.

BRITTON (W. E.) & ZAPPE (M. P.). **European Corn Borer Clean-up Work in 1926.**—*Connecticut Agric. Expt. Sta.*, Bull. 285, pp. 239–243, 1 map. New Haven, Conn., February 1927.

The work of eradicating the European corn-borer [*Pyrausta nubilalis*, Hb.] by means of burning maize stalks and weeds in and around infested fields with oil, begun in the autumn of 1925, was completed in the spring of 1926. In the summer of 1926 fresh infestations were found in six localities, though in certain cases isolated infestations in several localities had apparently been completely eradicated. A summary is given of the Federal quarantine restricting the movement of various plants on account of *P. nubilalis* [*R.A.E.*, A, viii, 511; etc.], which was extended to include a small area of Connecticut on 1st March 1927.

BRITTON (W. E.). **The Japanese Beetle in Connecticut.**—*Connecticut Agric. Expt. Sta.*, Bull. 285, pp. 244–252, 2 pls., 1 fig., 1 map, 37 refs. New Haven, Conn., February 1927.

In view of the fact that a few individuals of *Popillia japonica*, Newm. (Japanese beetle) were discovered in Connecticut in September 1926, a description of the adult is given, together with a brief account, taken from existing literature, of its life-history, habits and control. A small area in the extreme south-east of the State has been placed under Federal and State quarantine [*R.A.E.*, A, xv, 297]; a copy of the State quarantine order (no. 11) is appended.

BRITTON (W. E.). **A Co-operative Project in controlling the Asiatic Beetle, *Anomala orientalis*, Waterh.**—*Connecticut Agric. Expt. Sta.*, Bull. 285, pp. 252–255, 2 figs., 1 pl., 9 refs. New Haven, Conn., February 1927.

The information contained in the first part of this paper has already been noticed from another source [*R.A.E.*, A, xv, 442]. The text of the State Quarantine Order No. 10, regulating the transport of soil and plants from the infested area, which became effective 10th November 1926, is also given.

JOHNSON (J. P.). **Report of Quarantine and Control Work for the Asiatic Beetle during 1926.**—*Connecticut Agric. Expt. Sta.*, Bull. 285, pp. 257–264, 5 pls. New Haven, Conn., February 1927.

A short account of the work against *Anomala orientalis*, Waterh. (Asiatic beetle) described in this paper has been noticed from another source [*R.A.E.*, A, xv, 442]. The carbon bisulphide emulsion used in soil treatments was identical with that used against *Popillia japonica*, Newm. (Japanese beetle) [*R.A.E.*, A, xv, 144]; 7 parts of carbon bisulphide are emulsified with 3 parts of a soap consisting of 50 gm. ground lump resin dissolved in 135 cc. 7 per cent. sodium hydroxide solution (heated), 50 cc. oleic acid and 450 cc. water. In the bulk of the work 1 qt. emulsion was diluted with 50 gals. water, and the liquid

was applied at the rate of 3 U.S. pints to 1 sq. ft. Promising results were also obtained by diluting 1 qt. emulsion with 100 gals. water and applying the liquid at the rate of 1 U.S. gal. to 1 sq. ft., 100 per cent. of the larvae to a depth of 8 inches being killed in some cases, but further tests are necessary before application at the latter rate can be recommended. Lawn injury due to treatment did not exceed  $1\frac{1}{2}$  per cent. and injury to ornamental plants was negligible. In the spring lawns, shrubberies and flower beds in the infested area were treated, but in the autumn treatment was confined to lawns. An experiment was begun in which grass seed was sown in soil infested with grubs after treating the soil with acid lead arsenate. At the time of writing the seed was growing satisfactorily.

BRITTON (W. E.). **The Satin Moth in Connecticut.**—*Connecticut Agric. Expt. Sta.*, Bull. 285, pp. 264–267, 4 refs., 1 pl., 1 map. New Haven, Conn., February 1927.

The satin moth, *Stilpnotia salicis*, L., was discovered for the first time in Connecticut during 1926. The stages of the moth are briefly described and a short account of its life-history and control is given [*R.A.E.*, A, ix, 574], together with a map showing the areas (two towns) placed under Federal quarantine on its account [*R.A.E.*, A, xv, 192].

WALDEN (B. H.). **Abundance of *Ormenis pruinosa* Say on Ibota Privet.**—*Connecticut Agric. Expt. Sta.*, Bull. 285, pp. 267–268, 1 fig. New Haven, Conn., February 1927.

The Fulgorid, *Ormenis pruinosa*, Say, was very abundant in one locality on Ibota privet [*Ligustrum ibota*], ten miles of hedges being heavily infested although no injury was apparent. The dense foliage afforded so much protection to the insects that it was difficult to reach them with a spray of sufficient force to penetrate the waxy secretion with which they were covered. Other shrubs were also infested to some extent, without apparently being damaged, but a few plants of *Dahlia* and *Salvia* that were severely attacked showed signs of injury.

**Revision of Alfalfa Quarantine.** *Wisconsin Dept. Agric.*, Circ. 26, 3 pp. Madison, Wis., 30th October 1926. [Recd. July 1927.]

Further areas in Wyoming, Colorado and Nevada are placed under quarantine on account of *Hypera variabilis*, Hbst. (*Phytonomus posticus*, Gyll.) [*R.A.E.*, A, xii, 14; xiv, 161].

**Corn Borer Quarantine extended. Quarantine no. 4 (4th Revision).**—*Wisconsin Dept. Agric.*, 4 pp. typescript, 1 map. Madison, Wis., 12th January 1927.

This revision recasts the quarantine on account of *Pyrausta nubilalis*, Hb. (European corn borer) [*R.A.E.*, xiv, 161, 492] and prohibits the introduction into Wisconsin of maize and broom corn (including shelled maize) and *Sorghum* from Connecticut and certain areas in Illinois, Michigan, New Jersey and New York, which areas are not included in the Federal quarantine [*R.A.E.*, A, xv, 192]. Any products imported into the State in violation of the State or Federal quarantines are subject to destruction or return to the point of origin, at the discretion of the Department of Agriculture.

**Pertinent Information regarding the 1927 Spring Clean-up of Areas Quarantined on Account of the European Corn Borer.**—U.S. Dept. Agric., Misc. Circ. 102, 7 pp. Washington, D.C., February 1927.

Early in 1927 an appropriation of \$2,000,000 was made by the United States Government for the eradication and control of the European corn borer [*Pyrausta nubilalis*, Hb.]. This fund, with the support of legislation in the States concerned, makes it possible to organise a widespread campaign to retard the spread of the pest to fresh territory and reduce the damage done in the areas where it is already well established.

The work is to be organised in county units of 1, 2, or 3 counties, each unit being under the jurisdiction of a county supervisor who will be responsible to the Federal administrator. Each supervisor is to have a number of inspectors under him who will inspect the field and farm premises at intervals to determine and record the work that must be done or has been done to meet the regulations. The success of the campaign will depend largely on the co-operation of the farmers. Those that accomplish the necessary work satisfactorily will be entitled to a special allowance for extra labour, but any that fail to meet the regulations will be subject to assessment of costs for the required work and prosecution under the State laws.

Definite regulations and recommendations have been made, which set a standard for inspection, but the farmers are to be allowed as much freedom as possible to enable them to meet the regulations according to their own conditions. The main requirements are that all maize stalks, portions of them, or maize cobs in the field or elsewhere, should be satisfactorily disposed of before 1st May of the year succeeding the growth of the maize. Any maize remnants in the field and all coarse-stemmed pithy weeds within it must be treated by regular or special field procedure prior to that date, so that between 1st May and 1st June no portions of such material or rubbish capable of harbouring living borers shall appear on the surface of the field.

Recommendations are given and methods are described for complying with these regulations under varying conditions, such as in fields containing maize stubble, in those containing uncut stalks or both maize stubble and maize or fodder shocks, in fields that have already been ploughed or disked or harrowed for the succeeding crop, and in fields already sown and containing maize crop remnants on the surface.

Attempts are being made to arrange for the Government authorities to have a supply of the necessary equipment available, so that, if farmers desire it, they may be assisted in their work, some deduction being made for this from the extra labour allowance due to them.

WHITE (W. H.). **Cutworms in the Garden.**—U.S. Dept. Agric., Leaflet no. 2, 2 pp., 1 fig. Washington, D.C., March 1927.

Instructions are given for the control of cutworms attacking vegetables, the measure advocated being the use of a poison bait consisting of 5 lb. bran,  $\frac{1}{4}$  lb. white arsenic or Paris green, 1 U.S. pt. syrup or molasses and 3 or 4 U.S. qts. water, to be applied about the base of plants subject to attack, late in the evening. Two or three applications at intervals of 2-3 days, at the rate of 10 to 15 lb. of wet bait to the acre, may be required to effect complete control. Broadcasting the

bait over cultivated areas a few days before the crop comes up or is planted out will rid the field of many of the larvae that have hibernated in the soil.

MUESEBECK (C. F. W.). U.S. Bur. Ent. **New Species of Chalcid Flies parasitic on the Gipsy Moth Parasite, *Apanteles melanoscelus* (Ratzeburg).**—*Jl. Agric. Res.*, xxxiv, no. 4, pp. 331–333. Washington, D.C., 15th February 1927.

Among 35 parasites of *Apanteles melanoscelus*, Ratz., discovered in the course of studies made from 1922 to 1924 by the author and S. M. Dohanian, the following new species were found:—the Pteromalids, *Coelopisthia scutellata*, from New Hampshire, and *Hypopteromalus inimicus*, from Massachusetts and New Hampshire, and the Eulophid, *Dimmockia pallipes*, from Massachusetts.

*A. melanoscelus* is one of the most important parasites of *Porthetria dispar*, L. (gipsy moth) introduced into the New England States, and despite a large number of enemies has spread widely over the infested area [*R.A.E.*, A, x, 403].

FLEMING (W. E.). U.S. Bur. Ent. **Effect of Soil Microorganisms on Paraffin used as a Coating to decrease the injurious Action of Lead Arsenate on Plant Hosts.**—*Jl. Agric. Res.*, xxxiv, no. 4, pp. 335–338, 11 refs. Washington, D.C., 15th February 1927.

Quantities of lead arsenate sufficient to be toxic to the larvae of *Popillia japonica*, Newm. (Japanese beetle) when mixed with soil, proved injurious to certain plants, and coating the lead arsenate with paraffin and with various oils and fats did not reduce its toxic effect on them [*R.A.E.*, A, xiv, 526]. A study of the action of soil bacteria and soil fungi on lead arsenate coated with paraffin showed that in decomposing the paraffin coating bacteria were less active than fungi, which were stimulated by the paraffin. The conversion of the paraffin coating into organic acids by these agencies may explain the injurious action of the coated insecticide in the soil.

GAHAN (A. B.). U.S. Bur. Ent. **Four New Chalcidoid Parasites of the Pine Tip Moth, *Rhyacionia frustrana* (Comstock).**—*Jl. Agric. Res.*, xxxiv, no. 6, pp. 545–548, 1 ref. Washington, D.C., 15th March 1927.

The new parasites described are the Eulophids, *Hyssopus rhyacioniae* and *Elachertus pini*, from larvae of *Rhyacionia frustrana*, Comst., in Virginia, and *Secodella subopaca* from the same host in Virginia and Louisiana, and the Chalcid, *Haltichella rhyacioniae*, from pupae of *R. frustrana* in Virginia and Massachusetts and *R. frustrana bushnellii*, Busck, in Nebraska.

CHITTENDEN (F. H.). U.S. Bur. Ent. **Classification of the Nut Curculios (formerly *Balaninus*) of Boreal America.**—*Ent. amcr.*, vii (N.S.), no. 3 (December 1926), pp. 129–207, 8 pls., 7 refs. Brooklyn, N.Y., 2nd April 1927.

This paper has been written as an aid to the identification of the various species of the genus *Curculio*, formerly known as *Balaninus*, that inhabit America north of Mexico. The genus is discussed, and keys are given to the groups and species. Descriptions are given of 40 species, 20 of which are new, and two new varieties. Some of the

species are injurious to the fruit of chestnuts, pecan, hickory and hazel [*Corylus*], while the remainder, including the new species, as far as known, feed on the fruit of various oaks.

HASEMAN (L.) & SULLIVAN (K. C.). **[Miscellaneous Pests in 1925-26.]**  
—*Missouri Agric. Expt. Sta.*, Bull. 244, p. 36. Columbia, Mo.,  
November 1926. [Recd. June 1297.]

In Missouri experiments with calcium cyanide for greenhouse fumigation showed that most plants in the greenhouse will withstand a dose of 0.02243 gm. per cu. ft. The fatal dose required for whiteflies [*Trialeurodes vaporariorum*, Westw.] and Aphids is 0.00945 gm., for Coccids, 0.01475 gm., for thrips 0.02835 gm., and for red spider 0.08505 gm. per cu. ft. The following three dust formulae were used in orchard experiments against the codling moth [*Cydia pomonella*, L.]; 90 lb. sulphur with 10 lb. lead arsenate; 85 lb. sulphur with 15 lb. lead arsenate; and 80 lb. hydrated lime, 12 lb. powdered copper sulphate and 8 lb. calcium arsenate. The first two proved most effective. The results of spraying at pressures of 100, 150 and 250 lb. to the square inch against this moth, using three types of nozzle at each pressure, are given in a table showing the percentage injury by larvae that entered the calyces and sides of the fruit, determined from apples picked in the autumn. In the control of *C. pomonella* dusts gave as good results as sprays.

The Hessian fly [*Mayetiola destructor*, Say] may be controlled in wheat fields by ploughing under all stubble not sown with clover or timothy grass [*Phleum pratense*] some time after the wheat harvest; by cultivating the ground and destroying self-sown wheat in the summer and autumn; and by sowing wheat on or soon after the safe date as determined for the locality concerned.

HASEMAN (L.) & SULLIVAN (K. C.). **The Strawberry Crown Borer.**—  
*Missouri Agric. Expt. Sta.*, Bull. 246, 8 pp., 3 figs. Columbia, Mo.,  
February 1927. [Recd. June 1927.]

In Missouri, where it is a serious pest of the strawberry industry, the strawberry crown borer [*Tyloclerma fragariae*, Riley] has been found breeding extensively in uncultivated strawberry and several species of cinquefoil (*Potentilla*), infestation probably coming from these plants where new ground is cleared to form strawberry plantations. The life-history is briefly described [*R.A.E.*, A, x, 451]. There is only one generation a year, hibernation taking place in the adult stage in the soil or under rubbish. In south-western Missouri oviposition normally begins about the middle of March, and the adults emerge from the middle of August to November, the majority appearing in September.

No method of exterminating the pest when once it is established, except by ploughing the entire field, has yet been discovered, but a spray of lead arsenate, 2 lb. to 50 U.S. gals. water, applied in the early spring and late autumn will destroy some of the adults that feed on the foliage. To prevent beds from becoming infested, strawberries should not be planted on land where food-plants of the beetle have been growing until some other crop has been cultivated on it for one season; they should be transplanted early in the spring before the adults begin to oviposit, and should have earth and dead leaves removed from them; new plantings should be made as far from the old beds as possible; and all old beds should be ploughed after the third crop, after which some other crop should be cultivated on the land for one season.

JOHNSON (J.). **The Classification of Plant Viruses.**—*Wisconsin Agric. Expt. Sta., Res. Bull.* 76, 16 pp., 8 pls., 9 refs. Madison, Wis., February 1927. [Recd. June 1927.]

Plant viruses are discussed with particular reference to those attacking tobacco plants. A system of nomenclature is suggested, and eleven different viruses, including eight forms of mosaic, existing on tobacco and related plants are differentiated on the basis of various characteristics enumerated for each, which the author considers may be of use in evolving a system of classification.

HINDS (W. E.) & SPENCER (H.). **Sugarcane Borer Control aided through Utilisation of Infested and Trap Corn.**—*Louisiana Agric. Expt. Sta., Bull.* 198, 26 pp., 2 figs., 2 refs. Baton Rouge, La., April 1927.

The Pyralid, *Diatraea saccharalis crambidoides*, Grote (sugar-cane moth borer), has been recognised as the worst pest of sugar-cane in Louisiana for more than thirty years.

The seasonal occurrence, life-history and food-plants of the moth are discussed [*R.A.E.*, A, xii, 401 ; xv, 440]. There are five or six generations a year in Louisiana, the larvae of the last generation hibernating in rubbish left exposed on the surface of the ground, or in old maize stalks and rice stubble. On low ground water standing in furrows and covering the rubbish kills the larvae within, and this is more important in Louisiana during most winters than the effect of low temperatures. Burning the stubble, which should be followed by ploughing and burying the stalks, does not destroy more than one-third of the larvae, but exposes the remainder to a greater chance of subsequent destruction by water or cold.

Eggs are laid on maize in preference to cane ; the first two generations develop principally in maize in areas where it is commonly grown, and eggs laid on maize produce a larger proportion of moths than those on cane. If maize is eliminated, therefore, although the infestation will be more widely scattered in sugar-cane and the initial attack intensified, the number of adults will be considerably reduced by the end of the second generation. If, on the other hand, maize is grown and nothing is done to control the pest, there will be a considerably increased attack on late maize and on sugar-cane after the maize crop has matured. However, by cutting infested maize before the moths emerge from it a valuable check on the multiplication of the moth can be exercised, the control of the first generation being of the greatest importance as it is smaller and more definitely localised.

The planting of trap maize for the oviposition of the moths of the hibernating generation is not usually necessary, as most of the eggs are laid on early maize in fields and gardens. Trap maize to attract the moths of the first and second generations should be planted when the larvae of the same generations are first observed, the interval between the two plantings being 4–5 weeks, and a further planting should be made about a month later to attract the moths of the third generation. Indiscriminate interplanting of maize in poor stands of cane is inadvisable as it provides a favourable breeding-place for the moths without any possibility of removing the infested plants in an economical way. Trap maize should be from 2 to 4 ft. high, closely planted, and well cultivated. All maize fields will not be infested, as

the moths on emergence seek only such plants as are at a stage particularly attractive to them. Complete control cannot be secured by these methods, but a large reduction can be effected.

The presence of the larvae is first indicated by the perforations in the leaves, made during the first and second instars, and the stage of development of the insect can be determined by splitting open a number of stalks showing these perforations. Uninfested stalks may be left to mature, though if more than 25 per cent. are infested it is usually preferable to remove all stalks, cutting them to within 6-8 inches of the ground.

Hand dusting of maize with insecticides will also secure partial control of the larvae, two or more applications of sodium fluosilicate at intervals of from 10 to 15 days being required to cover the development of each of the first two generations, beginning a week after the first perforations are found. In 1926 two-thirds of the larvae present and even some of the pupae were destroyed by one application [*R.A.E.*, A, xv, 441]. This treatment will usually require from 3 to 5 lb. of dust to the acre, and one man should cover about one acre in an hour. Tables are given showing the results of experiments with various proprietary brands of sodium fluosilicate; severe scorching of the foliage occurred in almost every case. The addition of 10 per cent. hydrated lime (by weight) reduces scorching, but also reduces the degree of control. An increasing percentage of kill occurs during the first week after application and a diminishing percentage continues for more than another week; the percentage of kill among the fourth and fifth stage larvae is almost as high as that for the first three stages.

ESAKI (T.). **Verzeichniss der Hemiptera-Heteroptera der Insel Formosa.**

[List of the Heteroptera of Formosa.]-*Ann. hist.-nat. Mus. natnl. hung.*, xxiv, pp. 136-189, 1 map, 48 refs. Budapest, 23rd November 1926. [Recd. June 1927.]

The species recorded in this catalogue include: The Plataspids, *Coptosoma cribrarium*, F., on sugar-cane and rice, and *Tiarocoris consertus*, Dist., on mulberry; the Pentatomids, *Solenostethium chinense*, Stål, on *Citrus*, *Scotinophara scotti*, Horv., on sugar-cane and rice, *S. lurida*, Burm., on rice, *Erthesina fullo*, Thunb., on *Citrus* and *Acacia*, *Aenaria lewisi*, Scott, on rice, *Menida histrio*, F., on rice, sugar-cane and mulberry, *M. megaspila*, Wlk., on mulberry, *Rhynchoris humeralis*, Thunb., on *Citrus*, and *Andrallus spinidens*, F., on rice and cotton; the Coreids, *Anoplocnemis castanea*, Dallas, on gherkin and cotton, *Acanthocoris sordidus*, Thunb., on sweet potato, egg-plant and mulberry, *Pendulinus nicobarensis*, Mayr, on rice, *Cletus bipunctatus*, Westw., on sugar-cane, rice and mulberry, *C. trigonus*, Thunb., *Leptocoris varicornis*, F., and *Riptortus fuscus*, F., on sugar-cane and rice, and *R. linearis*, F., on rice and cotton; the Pyrrhocorid, *Dysdercus megalopygus*, Breddin, on cotton, sugar-cane, *Citrus*, etc.; the Lygaeids, *Cymus tabaci*, Mats., on sugar-cane and tobacco, and *Blissus* (?) *saccharivorus*, Okajima, on sugar-cane; the Tingid, *Serenthia formosana*, Mats., on sugar-cane; and the Capsids, *Lygus* (?) *oryzae*, Mats., and *L.* (?) *sacchari*, Mats., on sugar-cane and rice, *Helopeltis cinchonae*, Mann, on tea, *Engytatus tenuis*, Reut. (*Gallobellicus crassicornis*, Dist.), on tobacco and *Sesamum indicum*, and *Campylomma livida*, Reut., on *S. indicum* and indigo.

SERGEANT (E.) & ROUGEBIEF (H.). **Moucheron (Drosophiles) et fermentations. i. Propagation des levures dans les vignobles. ii. Disparitions des moisissures sous l'action des Drosophiles.**—*Arch. Inst. Pasteur Algérie*, iv, no. 4, pp. 519–527, 5 pls., 6 refs. Algiers, 1926. [Recd. May 1927.]

This is an abridged account of researches in connection with Drosophilids and their relation to yeasts and moulds on grapes already noticed [*R.A.E.*, A, xv, 60].

MENOZZI (C.). **Contributo alla biologia della *Phalacrotophora fasciata* Fall. (Diptera-Phoridae) parassita di Coccinellidi.** [A Contribution to the Biology of *P. fasciata*, a Parasite of Ladybirds.]—*Boll. Soc. ent. ital.*, lix, no. 5–6, pp. 72–78, 1 fig., 4 refs. Genoa, 30th June 1927.

The Phorid, *Phalacrotophora fasciata*, Fall., is a parasite of various Coccinellid beetles, ovipositing only on the larvae about to pupate or on newly-formed pupae. A list of the recorded hosts is given.

The author found 48 per cent. of *Adalia bipunctata* var. *sempustulata*, L., and 30 per cent. of *Chilocorus bipunctatus*, L., attacking *Kermes* (*Kermococcus*) *ilicis*, L., in Liguria to be parasitised by this Phorid, which was also observed on *Semiadalia undecimnotata* var. *novempunctata*, Fourcr., attacking *Toxoptera aurantii*, Boy., and on *Coccinella septempunctata*, L., attacking *Hyalopterus arundinis*, F. (*pruni*, F.).

SCHERPE (R.). **Ueber die Verwendung von selbstgebaute Tabak zur Herstellung von nikotinhaltenen Spritzflüssigkeiten.—Ein einfaches Verfahren zur Bestimmung des Nikotingehaltes in Tabaksausziügen.** [On the Use of home-grown Tobacco for the Production of Nicotine Sprays.—A simple Method for determining the Nicotine Content in Tobacco Extracts.]—*Centralbl. Bakt., Paras. Infekt.*, IIte Abt., lxxi, no. 1–7, pp. 93–105, 6 refs. Jena, 14th July 1927.

Experiments have been made since 1922 in order to discover what varieties of tobacco with a high nicotine content are suited to the climate of North Germany. Various varieties of *Nicotiana rustica* were found satisfactory.

Methods of preparing extracts and of determining their nicotine content are described.

HOWARD (L. O.). **The historical Development and present Organization of Applied Entomology in the United States.**—*Centralbl. Bakt., Paras. Infekt.*, IIte Abt., lxxi, no. 1–7, pp. 105–113. Jena, 14th July 1927.

The history of applied entomology in the United States is briefly reviewed from the early days to 1926. In August 1926 the U.S. Bureau of Entomology had a staff of about 575, while the total appropriation for the fiscal year beginning 1st July 1926 was over £525,000. Brief accounts are given of the State Experiment Stations, the Association of Economic Entomologists, the teaching of economic entomology, the Insecticide and Fungicide Board, and the Federal Horticultural Board.

STUTZER (M. J.) & WSOROW (W. J.). **Ueber Infektionen der Raupen der Wintersaateule** (*Euxoa segetum*, Schiff.). [On Infections of the Caterpillars of *E. segetum*.]—*Centralbl. Bakt., Paras. Infekt.*, IIte Abt., lxxi, no. 1–7, pp. 113–129, 18 refs. Jena, 14th July 1927.

In 1924 in the government of Voronezh alone about 225,000 acres of winter crops were destroyed by the caterpillars of *Euxoa segetum*, Schiff. In the course of studies on the biology and control of this Noctuid, the investigations recorded here in detail were made on the infectious diseases to which the caterpillars are subject. The spring epidemic among them in 1925 was due partly to muscardine fungus infection and partly to *Bacillus fluorescens septicus*, while the autumn epidemic was chiefly due to the latter. Laboratory infections with it occurred through injuries in the chitinous covering, and this is probably also the case in nature.

REISSIG (—). **Beobachtungen und Erfahrungen bei der Spannerbekämpfung mittels Flugzeuges im Jahre 1926.** [Observations and Experiences in combating *Bupalus piniarius* with Aeroplanes in 1926.]—*Forstw. Centralbl.*, xlix, 1926, pp. 81–89, 1 fig. (Abstract in *Centralbl. Bakt., Paras. Infekt.*, IIte Abt., lxxi, no. 1–7, pp. 168–169. Jena, 14th July 1927.)

In 1926 about 2,500 acres of forest in the Palatinate were dusted with two proprietary arsenicals against *Bupalus piniarius*, the better of which killed the larvae within 24 hours. A more handy, slow-flying aeroplane is desirable. Dusting from the ground is preferable in some circumstances; on very hilly ground small, portable dusters are needed, but otherwise heavy dust guns mounted on lorries or caterpillar-tractors should be used.

OBERDIEK (—). **Der grosse Waldgärtner** (*Hylesinus piniperda*) **und seine Bekämpfung.** [*Myelophilus piniperda* and its Control.]—*Zeitschr. Forst.- u. Jagdw.*, lix, 1927, pp. 101–114. (Abstract in *Centralbl. Bakt., Paras. Infekt.*, IIte Abt., lxxi, no. 1–7, p. 169. Jena, 14th July 1927.)

*Myelophilus* (*Hylesinus*) *piniperda*, L., is a secondary pest and only breeds in seriously injured pines. The feeding on the shoots may kill young trees if it follows heavy infestations by caterpillars. Control is based on careful thinning.

LOOS (K.). **Der Wanderflug der Nonnenfalter.** [The Migration Flight of the Nun Moth.]—*Sudendeutsche Forst.- u. Jagdtz.*, xxvii, 1927, pp. 33–34. (Abstract in *Centralbl. Bakt., Paras. Infekt.*, IIte Abt., lxxi, no. 1–7, p. 169. Jena, 14th July 1927.)

During the main flight period of the nun moth [*Lymantria monacha*] the swarms travel with the wind, the flight itself being at a rate of about  $6\frac{1}{2}$  miles an hour. The moths can cross mountains over 3,300 ft. in height.

GOEDEWAAGEN (M. A. J.). **Der Anbau des Kümmels in den Niederlanden. Eine zusammenfassende Darstellung über die Kümmelpflanze, ihre Kultur und ihre wirtschaftliche Bedeutung.** [The Cultivation of the Caraway Plant in Holland. A comprehensive Account of the Caraway Plant, its Cultivation and economic Importance.]—*Heil- u. Gewürz-Pflanzen*, ix, 1926, pp. 1-16. (Abstract in *Centralbl. Bakt., Paras. Infekt.*, IIte Abt., lxxi, no. 1-7, p. 175. Jena, 14th July 1927.]

In Holland the caraway plant is attacked by the caterpillars of *Depressaria nervosa*, Haw., which prevent the formation of seed. The gall-midge, *Lasioptera* (*Cecidomyia*) *carophila*, Lw., also infests the umbels, while *Chloropisca* (*Chlorops*) *glabra*, Mg., and *Psila rosae*, F., attack the roots.

ELZE (D. L.). **De verspreiding van virusziekten van de aardappel (*Solanum tuberosum*) door insekten.** [The Spread of Virus Diseases of the Potato by Insects.]—*Meded. Landbouwhoogeschool Wageningen*, xxi, no. 2, 90 pp., 3 pls., 128 refs. Wageningen, 1927. (With a Summary in English.)

Among the insects infesting potato in Holland *Myzus persicae*, Sulz., is the most numerous. *M. pseudosolani*, Theo., of which only the asexual forms are known, appears capable of surviving the winter in the open in Holland. *Macrosiphum gei*, Koch (*solanifolii*, Ashm.) is less numerous; its sexual forms have not been observed in Holland. *Aphis rhamni*, Boy. (*solanina*, Pass.) migrates to potato from its winter food-plant, *Rhamnus cathartica*. A fifth Aphid found, especially in the South, is *A. fabae*, Scop., whilst *Tychea phaseoli*, Pass., is seen occasionally on roots. *Eupteryx auratus*, L., another Jassid, probably *Empoasca* (*Chlorita*) *flavescens*, F., and the Capsid, *Lygus pratensis*, L., are numerous in the late summer. Of the remaining insects only the potato flea-beetle, *Psylliodes affinis*, Payk., is of any importance.

Numerous experiments were carried out to ascertain the relation of various insects to potato diseases, those tested being aucuba mosaic, interveinal mosaic, common mosaic, leafroll, crinkle, stipple streak, and spindling sprout, as described by Quanjér [*R.A.E.*, A, xii, 63]. Some of the experiments were negative or inconclusive, but definitely successful transmissions were obtained with the following: *M. persicae*, all diseases except aucuba mosaic; *M. pseudosolani*, leafroll, common mosaic, crinkle; *A. rhamni*, leafroll, crinkle, stipple streak; *A. fabae*, leafroll, common mosaic; *E. auratus*, leafroll, crinkle; the other Jassid, crinkle; *L. pratensis*, leafroll; *P. affinis*, leafroll, common mosaic, crinkle; *Barathra* (*Mamestra*) *brassicae*, L., common mosaic; and *Tipula paludosa*, Mg., leafroll.

As regards *M. persicae* and leafroll, the experiments point to an incubation period in the insect of between 24 and 48 hours. In two cases Aphids that had lived 7 and 10 days on an immune plant (spinach) after leaving the diseased potato plant, subsequently transmitted the disease. The virus is not transmitted from an Aphid to its young, but it is not lost when an Aphid moults. In tests with plants of varying ages young ones became diseased, while those infected nearer harvest time remained healthy. It may therefore be concluded that insects that increase in late summer are of little importance.

[VUISHELESSKAYA (N. S.).] **Вышелесская (Н. С.). Sodium Arsenite as an Insecticide.** [In Russian.]—*Défense des Plantes*, iii, no. 6, pp. 462–467. Leningrad, December 1926. (With a Summary in English.) [Recd. May 1927.]

Laboratory experiments have been made with solutions of sodium arsenite, the strengths of arsenic trioxide varying from 42.86 to 98.17 per cent., for the control of insect pests [cf. *R.A.E.*, A, xv, 469]. It proved impossible to prepare a sodium arsenite containing more than 85 per cent. of  $\text{As}_2\text{O}_3$ , so that in order to obtain a higher arsenic content a further amount of arsenic trioxide, which did not react, was added to the solution. The toxicity of the sodium arsenite increases directly with the increase of  $\text{As}_2\text{O}_3$  that it is able to contain, but the presence of undissolved arsenic trioxide decreases the toxic value. The proportion of alkali present does not influence the toxicity of the compound.

From an examination of cockroaches fed on poisoned bread, the lethal dose for these insects is shown to be about 0.118 mg. sodium arsenite containing 85.15 per cent.  $\text{As}_2\text{O}_3$  or 0.245 mg. containing 42.86 per cent.  $\text{As}_2\text{O}_3$ . In one case, however, a cockroach that had survived was found to contain 1.05 mg. of  $\text{As}_2\text{O}_3$ . It is possible that in cases of very slow poisoning the arsenic may accumulate in the body of the insect.

[LUCHNIK (V.).] **Лучник (В.). A List of Insects injuring Plants in the Stavropol Government in 1924.** [In Russian.]—*Acta Soc. ent. stauropol.*, i, pp. 9–15. Stavropol, 1925. [Recd. June 1927.]

The majority of the insect pests mentioned in this report have already been noticed from Stavropol [*R.A.E.*, A, i, 459; iii, 44, 479; iv, 458]; of the remainder the following occurred in abundance: *Haplothrips reuteri*, Karny, on wheat and rye; *Oria musculosa*, Hb., on winter-sown cereals in May; *Zabrus tenebrioides*, Goeze, on wheat; *Opatrum sabulosum*, L., which was particularly injurious to crops sown on hard soils; *Bruchus pisorum*, L. (*pisi*, L.), on field peas; *Rhynchites aeneovirens*, Mrsh., on fruit trees; *R. versicolor*, Costa, particularly injurious to late pears; *Macrophya punctum-album*, L., and *Melitaea matura*, L., on ash; *Pteronus (Pteronidea) ribesii*, Scop., on gooseberries; and *Arge rosae*, L., injuring both wild and cultivated roses.

The other pests recorded were *Scolytus mali*, Bechst., on apples; *Pteleobius vittatus*, F., on elm; and *Caliroa limacina*, Retz. (*cerasi*, auct.), which was observed in small numbers on fruit trees.

[RUMYANTZEV (P. D.).] **Румянцев (П. Д.). On the Biology of *Porthetria (Lymantria) dispar*, L. (Preliminary Paper.)** [In Russian.]—*Acta Soc. ent. stauropol.*, i, pp. 23–26. Stavropol, 1925. [Recd. June 1927.]

This is a short account of observations on *Porthetria dispar*, L., made in the Stavropol district in 1925. As a result of laboratory experiments, lists are given of preferred and other food-plants and of plants that are not attacked; the larvae can live from 3–7 days without food. Large pieces of the leaves are dropped to the ground during feeding, the injury to the trees being greatly in excess of the actual amount eaten by the larvae. The first pupae were found in the forest in the latter

half of June, the majority of the larvae pupating about the beginning of July. Adults emerged in abundance about the middle of July, oviposition occurring near the point of emergence.

Before the leaves appeared a large number of eggs were destroyed by *Trombidium* sp. A number of Hymenopterous and Dipterous parasites attacked the larvae, which were also destroyed by *Calosoma scyophanta*, L.

[GRINEV (Yu.). Гринев (Ю.). **The Biology of *Eurydema ornatum*, L.** *In Russian.*—*Acta Soc. ent. stauropol.*, i, pp. 27–32. 5 refs. Stavropol, 1925. [Recd. June 1927.]

*Eurydema ornatum*, L., has two generations a year in the Stavropol district [cf. R.A.E., A, xv, 159]. The eggs of the second generation are laid towards the end of July and beginning of August. It is the larvae from these eggs that are the most injurious to cultivated crucifers. The winter is passed in the adult stage under fallen leaves, etc. In the spring the bugs occur mainly on cruciferous weeds. Pairing occurs about the middle of May, and the eggs are laid in batches of about twelve. It is not essential for fertilisation to take place between the laying of each batch of eggs. The eggs are laid on both surfaces of the leaves of the food-plants, and in the spring also on grasses, etc. They hatch more quickly when laid on dry substances than on fresh plants. The total life-cycle from egg to adult occupies from 40 to 45 days.

The remedial measures recommended are hand collection of adults early in the morning, collection or crushing of eggs, and the destruction of cruciferous weeds during the first half of the summer.

[GAVALOV (I. I.). Гавалов (И. И.). **A new Parasite of *Anisoplia segetum*, Hbst. (Col.).** *In Russian.*—*Acta Soc. ent. stauropol.*, ii, pp. 33–34, 1 ref. Stavropol, 1926. [Recd. June 1927.]

Adults of *Anisoplia segetum*, Hbst., were collected on *Agropyrum (Triticum) repens* during the summer of 1924 in the Crimea. From one of them a number of Sarcophagine larvae emerged; they pupated on 20th June, the adult flies emerging on 2nd July.

[GAVALOV (I. I.). Гавалов (И. И.). **Some injurious Beetles from the Crimea (Col.).** *In Russian.*—*Acta Soc. ent. stauropol.*, ii, pp. 39–42, 1 ref. Stavropol, 1926. [Recd. June 1927.]

*Otiorrhynchus asphaltninus*, Germ., occurred in large numbers on vines in various localities of the Crimea during the spring of 1923. Where adults were collected in buckets for several days, little damage was done, but in certain localities 60 per cent. of the buds of the vines were injured. *Epicometis hirta*, Poda. occurred in unusual abundance in 1924, the greatest damage being done to winter rye; fruit trees were not very seriously injured. A list of the plants on which the adults were found is given. The beetles were less abundant in 1925. *Oxythyrea funesta*, Poda (*stictica*, L.) caused considerable injury to fruit and ornamental trees and particularly to roses. *Apion longirostre*, Ol., occurred in 1924 on cultivated hollyhock. The adults appear in May and pierce the unopened buds, and from about the middle of June they eat the seed in the heads of the plant. Most of the injury is done, however, during the second half of the summer, when

the larvae feed on the seeds. They reach the adult stage in the autumn and hibernate, mostly in the heads of the plants, but also in the dried stems.

During 1924 *Scolytus scolytus*, F., caused some injury to *Ulmus montana* and *U. effusa*. Larvae were noticed under the bark in March, the adults occurring from the end of the month to the middle of May. Adults of the second generation appeared at the end of July and beginning of August. The pupae and adults of the first generation were attacked by some disease, and the pupae were found to harbour Nematodes. Galleries of *S. multistriatus*, Mrsh., were found in unhealthy elms, a number of *U. umbelifera* being killed by their attack during 1925.

[GAVALOV (I. I.). Гавалов (И. И.). On some injurious Insects observed in the Crimea, 1922-25. [In Russian.—Acta Soc. ent. stauropol., iii, no. 1, pp. 8-16, 3 refs. Stavropol, 1927.]

Many of the insect pests here recorded have already been noticed from previous papers [R.A.E., A, iii, 339, 613; v, 157, 158; and preceding paper]. In addition to these, *Aphis gossypii*, Glov., caused considerable injury to various cucurbits; *Sipha maidis*, Pass., attacked maize; and *Oria musculosa*, Hb., *Cephus pygmaeus*, L., and *Trachelus tabidus*, F., occurred on various cereals. The orchard pests included: *Hemerophila pariana*, Cl., on young apple trees; *Cossus cossus*, L., and *Epidiaspis betulae*, Bär., on apples and pears; *Stephanitis pyri*, F., *Neurotoma (Lyda) flaviventris* var. *pyri*, Schr., and *Contarinia pyrivora*, Riley, on pears; *Vanessa (Euvanessa) polychloros*, L., on pears and plums; *Hyponomeuta padellus*, L., on plums; *Caliroa limacina*, Retz. (*cerasi*, auct.), on pears and cherries; *Rhagoletis cerasi*, L., on cherries; *Lecanium (Physokermes) coryli*, L., on young peach trees, apparently recorded for the first time from the Crimea; *Hemerophila (Simaethis) nemorana*, Hb., on leaves and young fruit of figs (*Ficus carica*); and the following attacking various fruit trees: *Anuraphis kochi*, Schout. (*Aphis pyri*, Koch), *Hyalopterus arundinis*, F. (*pruni*, F.), *Pterochlorus (Pterochloroides) persicae*, Cholodk., *Hyberrina defoliaria*, Cl., *Cheimatobia (Operophthera) brumata*, L., *Malacosoma neustria*, L. (parasitised by *Apanteles spurius*, Wesm.), *Aporia crataegi*, L., *Taeniocampa stabilis*, View., *Scolytus mali*, Bechst., and *S. rugulosus*, Ratz., the last-named frequently accompanied by *Xyleborus (Anisan-drus) dispar*, F.

Cabbages were attacked by *Brevicoryne brassicae*, L., *Phyllotreta atra*, F., *P. nemorum*, L., *P. nigripes*, F., and *Phorbia (Hylemyia) brassicae*, Bch.; and carrots by *Psila rosae*, F.

Miscellaneous pests include *Thrips tabaci*, Lind., on tobacco; *Eriosoma lanuginosum*, Htg., *E. ulmi*, L., *Gossyparia (Eriococcus) spuria*, Mod., and *Cossus cossus*, on elms; *Lecanium corni*, Bch., on false acacia [*Robinia*]; *Gelechia malvella*, Hb., on cultivated hollyhock (*Althaea rosea*); and *Hyponomeuta cognatellus*, Hb. (*euonymi*, Zell.), on *Prunus mahaleb*.

Pests of stored cereals and flour include *Tinea granella*, L., *Sitotroga cerealella*, Ol., *Pyralis farinalis*, L., *Tenebroides (Trogosita) mauritanicus*, L., *Ptinus fur*, L., *Caenocorse ratzeburgi*, Wissm., *Tribolium confusum*, Duv., *T. navale*, F., and *Tenebrio obscurus*, F.

[NADSON (G. A.).] **Надсон (Г. А.). How do the Yeasts get on to Grapes?** [In Russian.]—*Vestnik Vinodel. Ukrain.*, xxviii, no. 6, pp. 323–328, 9 refs. Odessa, 1927.

This is a summary of the work of other authors concerning the occurrence of yeasts on grapes, including the relation of *Drosophila* to them [R.A.E., A, xv, 60], and also includes a short description of experiments undertaken with a view to ascertaining whether or not such yeasts are present in the air, the results of which proved negative.

[VASIL'EV (I.).] **Васильев (И.). *Pentodon monodon*, F., as a Vine Pest.** [In Russian.]—*Vestnik Vinodel. Ukrain.*, xxviii, no. 6, pp. 362–364, 3 figs., 6 refs. Odessa, 1927.

The larvae of the Dynastid, *Pentodon monodon*, F., cause considerable injury to grape-vines in the Ukraine by attacking the seedlings and particularly the rooted cuttings. They spend two years in the soil, the greatest amount of damage being done during their second year. Pupation occurs towards the end of the summer in a specially prepared chamber at a depth of about 6 inches, and the adults emerge about the following April. The eggs are laid in July and August in the soil. Collection of the larvae is recommended, particularly where maize, tobacco, potatoes, etc., have been previously grown. Maize should not be grown in the vicinity of vines.

[LIPETZKAYA (A.).] **Липецкая (А.). The Infestation of Grape Vines by *Otiorrhynchus turca*, Bohem., in the Anapa Region.** [In Russian.]—*Vestnik Vinodel. Ukrain.*, xxviii, nos. 5–6, pp. 297–301, 364–368, 2 figs., 7 refs. Odessa, 1927.

An account is given of the bionomics and control of *Otiorrhynchus turca*, Boh. [R.A.E., A, ii, 495; iv, 297], which is a very serious pest of grape-vines in the Anapa region of the Northern Caucasus; it caused a loss of about 97 per cent. of the crop in 1926. The need for studying this weevil under local conditions and evolving a satisfactory method of control is pointed out.

[UVAROV (B. P.).] **Уваров (Б. П.). Locusts of Central Asia.** [In Russian.]—Uzbekstansk. Opuitn. Stantz. Zashchitui Rast. [Uzbekstan Exptl. Sta. Plant Prot.], 214 pp., 280 figs., 5 pp. refs. Tashkent, 1927.

This book includes illustrated keys to and descriptions of all the species and races of ACRIDIDAE known from Central Asia, with notes on their ecology and distribution. Its primary aim is to assist the determination of the injurious forms in a given locality and of those likely to be confused with them. The area covered extends from the Kirghiz steppes in the north to the Himalayas in the south, and from the Caspian Sea to Lake Zaisan.

KALANDADZE (L.). **Beiträge zur Biologie einiger Forstschädlinge.** [Contributions to the Biology of some Forest Pests.]—*Anz. Schädlingsk.*, iii, no. 7, pp. 75–76, 1 ref. Berlin, 15th July 1927.

In investigations on the action of insecticides on the more important German forest pests, particulars were obtained on the length of life

and the amount of food taken under conditions very similar to those in nature. An adult of *Melolontha melolontha*, L. (*vulgaris*, F.) of average age eats 1.2 beech leaves a day. Larger quantities are eaten if the beetles have been without food for 2-3 days, and smaller quantities when they are old. The amount of spruce needles eaten by the caterpillars of the nun moth, *Lymantria monacha*, L., shows a very marked increase in each instar, fifth instar larvae about to pupate eating more than twice as much as all the other instars together, and doing the most important injury in an infestation. The larval life of the pine moth, *Bupalus piniarius*, L., depends largely on the weather, but in these observations the first and second instars each required 10 or more days; the third 10-12 days or sometimes even 14; the fourth 14-16; and the fifth sometimes 34 or even more. The fifth instar larvae lie in the ground for 2-3 weeks before pupating, but pupation sometimes occurs in the fourth instar. This is probably common in nature, when early defoliation has occurred during a severe infestation.

DYCKERHOFF (F.). **Infektionsversuche mit der Rübenblattwanze** (*Piesma quadrata*, Fieb.) **an Zuckerrübenkeimlingen im Jahre 1926.** [Infection Experiments with the Beet Leaf Bug, *Zosmenus quadratus*, on Sugar-beet Seedlings in 1926.]—*Anz. Schädlingssk.*, iii, no. 7, pp. 78-84, 5 figs., 1 ref. Berlin, 15th July 1927.

A series of experiments on the symptoms (leaf-crinkle and stunting of the plants) produced in sugar-beet seedlings as a result of infestation by *Zosmenus* (*Piesma*) *quadratus*, Fieb., showed that the typical injury can sometimes result after a single bug has infested the plant for as short a period as 24 hours. The probability of the symptoms occurring increases with the number of the bugs and when the heart or stem is attacked. An infestation by 10 bugs for 24 hours almost always results in the plant being affected, and in spring infestation by 30 bugs always produced the death of the seedling; no experiments could be made later. The period elapsing between the feeding of the bugs and the first appearance of the symptoms was 26-64 days. From the practical point of view it is important that *Z. quadratus* should be prevented from reaching the plants, and trap-belts are advocated for this purpose [*R.A.E.*, A, xiv, 310].

SPEYER (W.). **Frostspannerfragen.** [Winter Moth Questions.]—*Anz. Schädlingssk.*, iii, no. 7, p. 84. Berlin, 15th July 1927.

The winter moth [*Cheimatobia brumata*] may oviposit on the tree trunks below the adhesive banding, and the larvae can cross the band in spring when it has hardened. To prevent this the trunks should be scrubbed in winter with a 15 or 20 per cent. solution of fruit-tree carbolineum, or, better still, the banding should be renewed.

SPEYER (W.). **Das Absterben von Fischen und Regenwürmern infolge der Winterspritzung mit Obstbaumkarbolineum.** [The Death of Fish and Earth-worms as a Result of Winter Spraying with Fruit-tree Carbolineum.]—*Anz. Schädlingssk.*, iii, no. 7, pp. 76-77, 4 refs. Berlin, 15th July 1927.

In connection with the use of carbolineum against the apple sucker, *Psylla mali*, Schm., on the Lower Elbe, it was observed that pike

in the drainage ditches and earth-worms in the ground were killed owing to some of the insecticide falling on the ground or in the water.

SPEYER (W.). **Zur Frühjahrsbekämpfung des Apfelblattsaugers.** [The Spring Treatment against the Apple Leaf Sucker.]—*Obst- u. Gemüsebau*, lxxiii, no. 10, pp. 153-154, 1 ref. Berlin, 19th May 1927.

All the insecticides tested against the apple leaf sucker [*Psylla mali*, Schm.] on the Lower Elbe in 1926 [*R.A.E.*, A, xv, 228] proved unsatisfactory except various brands of fruit-tree carbolineum. Lime-sulphur is useless in dilute solutions against the larvae in early spring because its surface tension is very strong, being similar to that of water, so that it does not reach the larvae within the leaf-buds.

RITTERSHAUS (K.). **Studien zur Morphologie und Biologie von *Phyllopertha horticola* L. und *Anomala aenea* Geer (Coleopt.).** [Studies on the Morphology and Biology of *P. horticola* and *A. aenea*.]—*Zeitschr. Morph. u. Oekol. Tiere*, viii, no. 3-4, pp. 271-408, 149 figs., 3 pp. refs. Berlin, 9th August 1927.

*Phyllopertha horticola*, L., generally emerges from the soil in June in the neighbourhood of Berlin. It feeds on the flowers and leaves of rose, fruit crops and various forest trees, always preferring low bushes. After pairing, the female returns into the ground to oviposit. Asilid flies and various birds are natural enemies of the beetle. The eggs hatch in 15-20 days, and the larvae feed on the roots of various plants, including grasses, cereals, cabbage and clover. They burrow deeper into the soil in October. According to Binnenthal they hibernate as pupae, but, according to the author's observations, pupation does not take place till the following April.

*Anomala aenea*, DeG., appears at the end of June or beginning of July and, near Berlin, is found on moors and in rye and oat fields. The beetles eat the leaves of various trees and bushes. The eggs are laid in the ground, and hatch at the end of July or beginning of August, 25-35 days after oviposition. The larvae feed on the roots of grasses, cereals, willow, rose, etc. They pupate in the spring of the third year, and the adults emerge towards the end of June.

The morphology of both insects is fully described.

COLLINGE (W. E.). **Agricultural Pests and Plant Diseases observed in Yorkshire during 1926.**—*Jl. Yorks. Agric. Soc.*, 1927, reprint 21 pp., 8 figs.

Insect pests in Yorkshire were less numerous in 1926 than for many years past, owing both to climatic conditions and to clean cultivation. Those recorded are *Aphis atriplicis*, L. (mangel aphid) on mangels; the leaf hoppers, *Empoasca* (*Chlorita*) *flavescens*, F., and *E. (C.) viridula*, Fall., on beans, potatoes and other plants; *Ceuthorrhynchus sulcicollis*, Gyll. (cabbage gall-weevil), which attacks cruciferous weeds early in the season and later causes damage to cabbage and turnip; *Otiorrhynchus picipes*, F. (clay-coloured weevil), recorded in one instance as attacking various plants in a greenhouse; *Tipula oleracea*, L., on grasses; *Pegomyia hyoscyami* var. *betae*, Curt., on mangels and

beet; *Trialeurodes* (*Aleurodes*) *vaporariorum*, Westw., on tomato in greenhouses; *Eriophyes ribis*, Nal., on black currant; *Lepidosaphes ulmi*, L., on apple; *Cheimatobia brumata*, L., on various fruit trees; *Phalera* (*Pygaera*) *bucephala*, L., on lime and birch; and *Leucoptera* (*Cemistoma*) *laburnella*, Staint., on laburnum.

An outline of the life-history of each of these insects is given, with notes on its control.

JENKINS (J. R. W.). **A Survey of the Insect Pests of Mid and West Wales.**—*Welsh Jl. Agric.*, iii, pp. 196–220, 1 ref. Cardiff, January 1927. [Recd. June 1927.]

Large numbers of insect pests of cultivated crops are recorded as the result of a survey of Mid and West Wales during the years 1923–26. These insects are listed under the crops they attack, and notes are given on the distribution, time of occurrence, and severity of infestation.

JONES (H. L.). **Winter Spraying of Fruit Trees with Carbolineum Washes.**—*Welsh Jl. Agric.*, iii, pp. 298–302. Cardiff, January 1927. [Recd. June 1927.]

In order to obtain trustworthy information as to the relative efficacy of various proprietary brands of tar distillate sprays and to determine their suitability for use in North Wales, experiments were carried out in different localities. The results showed that these sprays are more effective than such winter washes as caustic soda, lime-sulphur or lime wash, and in some cases a single spraying controlled such pests as the leaf-curling plum aphid, *Anuraphis helichrysi*, Kalt. (*prunina*, Wlk.), *Psylla mali*, Schmid., and mussel scale [*Lepidosaphes ulmi*, L.]. Control of winter moth [*Cheimatobia brumata*, L.] and similar larvae cannot be relied on, and a spray of 1 lb. lead arsenate to 20 gals. water applied after the blossom falls is recommended for these pests, and, for standard trees, grease banding. In all cases the various sprays were applied at a concentration of  $7\frac{1}{2}$  per cent., but the author believes that it is possible to apply concentrations up to 10 per cent. on apples and plums if this is done when they are absolutely dormant. All brands do not give equally good results, but all of them cleanse the trees of lichen and moss, and apparently do no injury, since those sprayed seemed to make a far more vigorous growth than untreated ones.

FEYTAUD (J.). **Les insectes du châtaignier.**—*Rev. Zool. agric. & appl.*, xxvi, nos. 1 & 3, pp. 10–13 & 33–37, 2 refs. Bordeaux, January & March 1927.

This is a popular review of the insect pests of the chestnut tree, of which the two most important are *Cydia* (*Carpocapsa*) *splendana* and *Curculio* (*Balaninus*) *elephas*, which infest the nuts. While the larvae of the former leave the nuts for pupation, many of the latter remain within them when gathered and continue to develop in the storehouses. Measures against these pests in the field, such as spraying, as carried out in the United States are not suitable to the conditions obtaining in France, where the trees are not grown in plantations. Fumigation is considered the best method of control, and various fumigants are suggested.

PAILLOT (A.). **Les affections du tube digestif chez le ver à soie.**—*Rev. Zool. agric. & appl.*, xxvi, no. 3, pp. 37–41. Bordeaux, March 1927.

This is a review of the various diseases of silkworms, accounts of which have appeared in previous papers. The author discusses the relative importance of these diseases, their normal occurrence, their reaction to each other, and the practical recommendations for silkworm cultivation to be deduced from their study.

[**Italy : Decree of 3rd March 1927 on Importation of Plants.**]—*Internat. Rev. Sci. & Pract. Agric.*, xviii, no. 3, pp. T 185–T 187. Rome, April 1927. [Recd. June 1927.]

These regulations relating to the importation of plants into Italy came into force 1st May 1927. Prohibited imports include plants and fruits of the banana against *Pseudococcus comstocki* and *Iridomyrmex humilis*; plants and fruits of pineapple against scale-insects; whole almond fruits against *Eurytoma [amygdali]*; fresh palm and laurel leaves against scale-insects; *Citrus* fruits and fresh peel against *Lepidosaphes gloveri* and *Dialeurodes (Aleurodes) citri*; potato tubers, fruits and green parts of all Solanaceae against *Phthorimaea operculella*, *Leptinotarsa (Doryphora) decemlineata* and *Epitrix cucumeris*; fruits from Canada, United States, Chile, Hawaii, Japan, China, Australia, S. Africa and Argentina against *Aspidiotus (Aonidiella) perniciosus*, *Cydia (Laspeyresia) molesta*, and fruit-flies; and stalks and cobs of maize from Africa against *Sesamia calamistis*.

[**Libya : Decree of 13th September 1926 on Importation of Plants.**]—*Internat. Rev. Sci. & Pract. Agric.*, xviii, no. 3, pp. T 187–T 188. Rome, April 1927. [Recd. June 1927.]

These regulations on the importation of plants into Libya include almost identical prohibitions as regards insects as the Italian ones [see preceding paper]. Additional pests mentioned are *Chrysomphalus aonidium* on *Citrus*, and *Cosmopolites sordidus* on banana, while the importation of plants and seeds of cotton from the United States, Mexico, Central America and Egypt is prohibited against *Anthonomus grandis*, and *Platyedra (Pectinophora) gossypiella*.

BERLESE (A.). **International Instruction regarding the Application of the Method of Artificial Control of the Olive Fly.**—*Internat. Rev. Sci. & Pract. Agric.*, xviii, no. 5, pp. T 307–T 311. Rome, June 1927.

This is an account of the method of combating the olive fly, *Dacus oleae*, Gmel., by means of a sweetened sodium arsenite bait-spray [*R.A.E.*, A, xii, 557].

[**Dutch East Indies : Legislation regarding the Importation of Plants.**]—*Internat. Rev. Sci. & Pract. Agric.*, xviii, no. 5, p. T 317. Rome, June 1927.

As from 15th November 1926 living plants or parts of plants, including fruits and seeds, exported from any country to the Dutch East Indies

must be accompanied by a certificate issued by the Government of the country of origin stating that the products are free from diseases or insect pests. A list is given of plants that are exempted. The importation from all South American countries of plants or parts of plants, including the seed, of *Hevea brasiliensis* is forbidden.

HAZELHOFF (E. H.). **Biologische bestrijding van de witte wolluis** (*Oregma lanigera*, Zehnt.) **door overbrenging van den inheemschen parasiet** *Encarsia flavoscutellum*, Zehnt. (Voorloopige mededeeling.) [The biological Control of the White Woolly Aphis, *O. lanigera*, in Java by transferring the native Parasite, *E. flavoscutellum*.]—Arch. Suikerind. Ned.-Indië; Meded. Proefst. Java-Suikerind., 1927, no. 11, pp. 543-556. Pasoeroean, 1927. (With a Summary in English.)

Observations were begun in 1927 on the value of the native Chalcid, *Encarsia flavoscutellum*, Zehnt., in controlling the white woolly aphid, *Oregma lanigera*, Zehnt., infesting sugar-cane in Java [*R.A.E.*, A, xiv, 591, 592]. In February-April the percentage of parasitism was investigated at 45 plantations in various parts of the island. The Chalcid was very numerous in 41 plantations, but in two the percentage was less than 2 per cent., and in two others the parasite did not occur. When, however, it was introduced into these two plantations, 50 per cent. or more of the Aphids became parasitised in a few weeks. As a three-year rotation of crops is practised in Java, both the Aphid and the Chalcid have to migrate each year from the old to the young fields. The cane is harvested from May to October and planted from April to August. *O. lanigera* is present in most of the young fields from August to November, but spreads with alarming rapidity only in a few fields. It is probable that the Chalcid has failed to establish itself in time in the latter. As stated, *E. flavoscutellum* is capable of checking *O. lanigera* during February-April within a few weeks of its introduction. If it can do so in the period August-November, it is obvious that its importation from old to young fields would be a successful method of combating the pest. This is to be investigated.

HORI (M.). **Some new Aphids from Hokkaido.**—*Insecta Matsumurana*, i, no. 4, pp. 188-201, 6 refs. Sapporo, Japan, May 1927.

The new Aphids described are *Acaudus jozankeanus* on *Polygonum sachalinense*; *A. rhamnii* on *Rhamnus japonica*, causing considerable leaf-curling; *Anuraphis japonica* on *Lonicera morrowi*; *A. mume* abundant in the spring and early summer on the tender shoots and leaves of *Prunus mume* and peach (*P. persica*), the summer food-plant being unknown; *A. rumeicicola* on *Rumex crispus*; and *Pergandeidea kalopanacis* occurring throughout the year on *Kalopanax ricinifolius*, the eggs being laid in dense masses at the bases of buds and shoots.

The eggs of *Anuraphis japonica* are laid in the autumn on the twigs of *L. morrowi* and hatch in the following spring. Mature stem mothers deposit living young on the tender shoots in the latter part of May. Winged forms appear in the second generation, gradually increasing in numbers in each subsequent generation until by the end of July all have migrated to some unknown summer food-plant. They return to *L. morrowi* at the beginning of October.

MATSUMURA (S.). **Summary of the Japanese *Xiphydria*-Species.**—*Insecta Matsumurana*, i, no. 4, pp. 202–206. Sapporo, May 1927.

Nine Japanese Siricids of the genus *Xiphydria* are listed with keys, of which six are new, including *X. kawakamii* and *X. jezoensis*, the larvae of which bore in *Alnus*, while the adult of the former enters houses and attacks silkworms [*Bombyx mori*, L.].

CHEVALIER (A.). **Une attaque des cocotiers par l'*Aspidiotus destructor* à Conakry.**—*Rev. Bot. appl. & Agric. colon.*, vii, no. 69, p. 338. Paris, May 1927.

*Aspidiotus destructor*, Sign., has been found causing damage to coconut palms in French Guinea. A Coccinellid was observed apparently attacking the scale.

VAYSSIÈRE (P.). **Les ennemis des cultures coloniales.**—*Actes & C.R. Assoc. Colon.-Sci.*, iii, no. 23, pp. 100–110 [in] *Rev. Bot. appl. & Agric. colon.*, vii, no. 69. Paris, May 1927.

The extent of insect depredations in the French Colonies and the importance of the organised administration of control measures has never been sufficiently realised. The locust problem is one of the most pressing and the least understood, especially with regard to Africa. The Algerian crop protection service disbursed £14,400 during the years 1915–1923 in a campaign against *Schistocerca gregaria*, Forsk., and the Moroccan locust [*Dociostaurus maroccanus*, Thnbg.]. Besides the actual loss of crop to the grower, there is the loss to the industries depending on that crop, so that it is difficult to estimate the total damage caused by such pests, but it has been said that several million pounds annually are probably lost in the countries devastated by locust outbreaks. Nevertheless, very little is known of *S. gregaria*, although it extends throughout northern Africa and part of Asia.

Practically every crop grown in the French Colonies is subject to the attacks of various pests with which the country is unable to deal, such as *Xylotrechus quadripes*, Chevr., on coffee in Indo-China; *Stephanoderes hampei*, Ferr. (*coffeae*, Hag.) on the west coast of Africa; *Icerya purchasi*, Mask., and other pests on vanilla in Tahiti and Madagascar; and *Hispa gestroi*, Chap., a beetle attacking rice in Madagascar.

In view of the importance of developing cotton culture in the colonies, every effort must be made to keep down the insect enemies of that crop and to avoid the introduction of any new pest. A list of cotton pests in each region should be drawn up, and the exact status of each determined by a thorough biological investigation. It is above all essential to appoint both entomological and pathological experts, and a plan should be outlined for dealing with the insect pests occurring in the colonies in the most economical way possible. Of all precautions, that of inspection of imports on arrival seems to afford the greatest measure of security. The organisation of an autonomous service for the protection of colonial produce, under the administration of a central office in Paris, is outlined, and the necessary staff and expenditure are discussed. The legislation that has already been passed with a view to suppressing insect pests in the French Colonies is briefly reviewed, but much remains to be done in this respect, and the legislation should be made uniform throughout.

RÉGNIER (P. R.). **Les Acridiens ravageurs du Maroc.**—[Morocco:] *Dir. gén. Agric., Comm. & Colon., Défense des Cultures*, no. 1, 24 pp., 3 pls., 3 figs. Rabat, 1926. [Recd. June 1927.]

This is a comparative account of the three species of locust causing damage in Morocco: *Schistocerca gregaria*, Forsk., *Dociostaurus maroccanus*, Thnbg., and *Calliptamus italicus*, L. The distribution of each of these species is given, and the characters distinguishing them are indicated.

Females of *S. gregaria* oviposit immediately after mating and at intervals of 15 to 20 days, the maximum number of ovipositions in captivity being eleven. One female is capable of laying from 500 to 900 eggs. The eggs hatch in from 16 to 40 days, this period being extended to 70 days in the case of eggs laid in the winter. Eggs dug up and exposed to the sun 3 or 4 days after oviposition do not hatch. The adult stage is reached in 37–40 days, six moults taking place during this period. The adults live for 7 to 11 months, mating from 40 to 50 days after the sixth moult. Observations made in Algeria and Tunisia show that at the time of an outbreak the first flights of migratory locusts coming from Central Africa reach in winter the territory south of the Atlas Mountains, which they leave in the spring. The Agadir gap admits of the passage of locusts coming from the south, which thus arrive much earlier in that region of Morocco. These locusts do not oviposit until they have passed the mountains. The second generation immediately upon reaching the winged stage returns to the Sahara, where it hibernates, the next generation returning as soon as the climatic conditions are favourable to the territory between the Atlas and the sea.

In the case of *D. maroccanus* mating takes place during May in Algeria from 8 to 25 days after the last moult, the female ovipositing from 4 to 6 times in the course of the summer and depositing from 30 to 50 eggs each time. Eggs deposited in winter do not hatch before the following spring, the incubation period being sometimes as long as 10 months. The egg-mass is resistant to the action of water and low temperatures, though hatching may be delayed by immersion. Heat only accelerates the development of the egg in the period immediately preceding emergence. The larval stage, which consists of 6 instars, lasts from 43 to 55 days.

The larvae can resist a temperature of 0° C. [32° F.]. The adult does not appear to live for more than 60 days, the winged insect making its appearance in May in Algeria.

The female of *C. italicus* oviposits from 4 to 6 times in two months, from 25 to 45 eggs being laid at each oviposition. These eggs hibernate in the ground, being resistant to very low temperatures and prolonged immersion, and hatch in the following year between April and June. In Northern Africa the larval stage usually lasts from 30 to 33 days and consists of 5 instars. This locust does not make migratory flights, but multiplies to considerable proportions in its normal habitat.

R[ÉGNIER] (P. R.). **La lutte contre les Acridiens ravageurs.**—[Morocco:] *Dir. gén. Agric., Comm. & Colon., Défense des Cultures*, no. 2, 24 pp., 7 pls. Rabat, 1926. [Recd. June 1927.]

This paper is a comprehensive review of the measures available against locusts. Measures against the larvae, to which most attention

is devoted, include the use of insecticides in the form of sprays and baits; burning, burying and crushing; and the use of barriers and traps, which are described in great detail.

EGGERS (H.). **Neue Borkenkäfer (Ipidae, Col.) aus Africa (Nachtrag iii).** [New Bark-beetles from Africa. (Supplement iii).]—*Rev. zool. afr.*, xv, pt. 2, pp. 172-199. Brussels, 1st June 1927.

In this further supplement [*R.A.E.*, A, xii, 435] 28 new Scolytids are described from various parts of Africa, including *Hypothenemus pusillus* on *Pithecolobium altissimum*, cotton and dried cacao pods, *Stephanoderes perhispidus* on *Elaeis guineënsis*, *Xyleborus subsulcatus* on cacao, and *X. africanus* and *X. subtuberculatus* on cotton, all from the Belgian Congo.

Several Scolytids are recorded from fresh localities, including *Stephanoderes bananensis*, Eggers, and *Xyleborus tropicus*, Hag., on cotton in the Belgian Congo.

STOREY (H. H.). **Streak Disease of Maize.**—*Farming in S. Africa*, i, no. 6, pp. 183-185, 6 figs, 3 refs. Pretoria, September 1926. [Recd. June 1927.]

This is a popular account of streak disease of maize transmitted by the Jassid, *Balclutha mbila*, Naude [*R.A.E.*, A, xiv, 18].

It has been proved at Durban that leafhoppers that feed upon diseased maize can survive through the winter and infect the spring crop. Though no practical means are available for destroying *B. mbila* in the field, certain cultural measures can be adopted to hinder its winter survival and avoid infection. These include destroying all self-sown maize, refraining from planting garden maize before the main crop is put in, planting the main crop as early as possible, since the severity of the infection increases as the season advances, and removing all diseased plants during the early stages of their growth.

**Fruit-fly Campaign at Cedara.**—*Farming in S. Africa*, i, no. 6, p. 186. Pretoria, September 1926. [Recd. June 1927.]

The spraying of fruit-trees with Mally bait [*R.A.E.*, A, i, 195], which has been quite successful under western Cape Province conditions against the Mediterranean fruit-fly [*Ceratitis capitata*, Wied.], proved useless against the Natal fruit-fly [*Ceratitis rosa*, Ksh.] under the climatic conditions prevailing at Cedara, where plums showed 50 to 100 per cent. infestation in spite of treatment. Experiments were therefore made to develop new methods of control by means of baiting the entire orchard with pans of poisoned fermenting pollard bait placed on the ground between the trees. Throughout the winter, the flies, which are not resistant to frost, have been found in the pans, except when driven by cold weather to take shelter in gum-trees [*Eucalyptus*] or other leafy trees, where the minimum temperature was 42° F. although the water in the pans 3 yds. away was at times frozen over. During heavy frosts, flies were only caught in appreciable numbers in pans near these trees.

TUCKER (R. W. E.). **Tomato Erinose (Wit Roes).**—*Farming in S. Africa*, i, no. 6, pp. 200 & 206, 1 fig. Pretoria, September 1926. [Recd. June 1927.]

Erinose of tomatoes, which is widely distributed in South Africa, and may, under certain conditions, cause complete loss of the crop, is caused by the mite, *Eriophyes cladophthirus*, Nal., which feeds on the plants by puncturing the surface cells and sucking the juices, thereby setting up an irritation that results in the formation of a felt-like growth where the mites find protection and food, and gives a silvery white appearance to the foliage. When infestation, which is due to mites carried by the wind or flying insects, originates from a distant source, the disease develops late enough to admit of the plants yielding a crop before they succumb, but where, owing to bad cultural practice, seed-beds become infected, the plants suffer at an early stage and bear no crop, and infestation may spread over wide areas. Comparative air stagnation results in concentration of the mites on the plants and a rapid infestation, which may kill the entire crop.

Preventive measures include clean cultivation and avoidance of overcrowding in the seed-bed; the application of a lime-sulphur spray, 1 in 75 or 1 in 100 according to the temperature, when the plants reach a height of 2 inches or more and a second spray from 10 to 14 days later; pulling out and burning of plants showing signs of infestation; and dusting with sublimated lime-sulphur within a week of the plants being established in the field, where they should be set at least 3 ft. apart without interplanting where possible.

RIPLEY (L. B.). **Substitutes for Prickly-pear in Cutworm Bait.**—*Farming in S. Africa*, i, no. 6, p. 207. Pretoria, September 1926. [Recd. June 1927.]

Experiments were carried out to discover suitable substitutes for prickly-pear in sodium fluoride cutworm baits [*R.A.E.*, A, xiii, 39]. Certain plants with similar succulent tissue (*Cotyledon*, *Kalanchoë* and *Mesembryanthemum*) proved suitable and baits made with potato or pumpkin also gave satisfactory results, the pumpkin destroying a somewhat larger percentage of the caterpillars, probably owing to its greater power of absorbing the poison. Turnips, swedes and mangels may be used as well as potato, but all these are liable to carry Nematodes and other infections not necessarily destroyed by the sodium fluoride, and the special cultivation of a small patch of spineless cactus is recommended in preference to incurring the risks connected with their use. Maize ensilage and similar substances are not readily eaten by the cutworms and dry up too quickly.

**Banana Root-stock Borer.**—*Farming in S. Africa*, i, no. 6, p. 209. Pretoria, September 1926. [Recd. June 1927.]

*Cosmopolites sordidus*, Germ. (banana weevil), one specimen of which was found in Natal in 1924 though not identified, was recognised there for the first time in 1925 in a fresh tunnel of a banana root-stock. The damage done is apparently not extensive, and there is no reason to believe the introduction of the weevil to be recent. Its general distribution is given together with extracts from a paper [*R.A.E.*, A, ix, 151] on its bionomics and control in New South Wales.

[Uganda:] **The Importation of Plants Ordinance.**—1 p. typescript. Entebbe, June 1927.

This is a revision of the prohibition on the importation from countries where it occurs of alternative food-plants of *Platyedra gossypiella*, Saund. (pink cotton bollworm) [R.A.E., A, xi, 419].

DECARY (R.). **Note sur l'apparition, les effets destructeurs et la disparition rapide d'une cochenille (Hem.).**—*Bull. Soc. ent. France*, 1927, no. 9, p. 150, 2 refs. Paris, 1927.

*Dactylopius coccus*, Costa (*Coccus cacti*, auct.) was recorded from Madagascar for the first time in 1924, having apparently been introduced accidentally from the neighbouring Island of Réunion, where it is abundant. It immediately began to reproduce in enormous numbers on the cactus, *Opuntia dillenii*, which was growing wild on all the uncultivated land in the neighbourhood, and in 1925 the entire plants and fruits were covered with the insects. The infestation was so complete that the *Opuntia* quickly died down, and by the end of 1926 had entirely disappeared, the Coccids being consequently exterminated. Spineless species of *Opuntia* growing amongst the prickly one remained free from attack.

DUPONT (P. R.). **Insect Notes.**—*Seychelles: Ann. Rept. Dept. Agric.* 1926, pp. 3-4. Victoria, Seychelles, 1927.

In addition to Coccids already noticed as attacking coconut palms in the Seychelles [R.A.E., A, xiv, 229, 523], *Aspidiotus palmarum*, Ckll., caused damage in coconut plantations in 1926. *Pinnaspis buxi*, Bch., occurs on *Heliconia*, *Dracaena* and *Pandanus* as well as on coconut, while *Chrysomphalus anseii*, Green, is also recorded on leaves of *Tetranthera laurifolia*. Another scale-insect, *Coccus elongatus*, Sign., not hitherto recorded, was found attacking leaves of *Albizia lebbek*.

A fungus (*Septobasidium* sp.) not regarded hitherto as effecting important control of scale-insects, was identified as being parasitic on *Ischnaspis longirostris*, Sign. (*filiformis*, Dougl.), which is commonly found on coffee and *Stachytarpheta* as well as on coconut. The damage done to coconut by *Eucalymnatus* (*Lecanium*) *tessellatus*, Sign., is checked by the fungus, *Cephalosporium lecanii*. Other insects identified during the year include *Phytometra chalcites*, F., attacking leaves and fruit of tomatoes and *Lamprosema indicata*, F., on leaves of peppermint.

DE OLIVEIRA FILHO (M. L.). **Contribuição para o conhecimento da Broca do Café *Stephanoderes hampei* (Ferr. 1867). Modo de comportar-se e ser combatida em São Paulo-Brasil.** [A Contribution to the Knowledge of the Coffee Borer, *S. hampei*. Its Habits and Control in S. Paulo, Brazil.]—*Comm. Estudo e Debellação da Praga Caféeira*, Pub. no. 20, 95 pp., 44 pls. S. Paulo, 1927. (With a Summary in English, pp. 77-92.)

*Stephanoderes hampei*, Ferr., the methods of controlling which in S. Paulo are described [R.A.E., A, xv, 454, etc.], was introduced into the State in seeds imported by a private individual for cultivation. The abnormal rains in 1920-24 caused large numbers of coffee berries to be left on the ground, and this gave rise to a great increase of the beetles. In May 1924 when the pest was brought to the notice of the

authorities, from 90 to 100 per cent. of the berries were infested in the most severely affected estates. In September 1924 in a total of 24,700,000 coffee bushes in the Campinas district, about 8,000,000 were attacked.

The pest spreads gradually from infested centres. When the females abandon the berries left in the plantations after the harvest, during which all the berries are picked, and not only the ripe ones as is usual in other countries, they attack even quite young berries. Migration to new fruits occurs throughout the year. The females resist death in buried fruits for one or two months, until the latter rot or germinate, and can oviposit in buried fruits. The best conditions for the females are provided by a shade temperature of 20° to 30° C. [68° to 86° F.] and by an environment with a certain amount of moisture. They are also active on warm nights. When the temperature falls below 15° C. [59° F.], they become inactive and endeavour to hide, preferably in a coffee berry, though they occasionally shelter by boring in beans, maize, peanuts, cottonseeds, etc. that are dry or nearly so. They survive temperatures just below freezing, a temperature that very rarely occurs in Brazilian plantations.

Once oviposition has started in a new gallery, the females normally only abandon the berry when about to die. Migration occurs when the fertilised female is seeking to oviposit, when oviposition having commenced, the female seeks moister berries after being driven out by the heat of the sun, when unfertilised females seek males, when the seeds are waterlogged or becoming destroyed or are overcrowded with adults and larvae, and when the beetles are disturbed. The males remain in the berry where they hatched until near death. The female bores a gallery the diameter of her body; it terminates in a chamber where the eggs are laid. Sometimes other females oviposit in the same gallery, in which cases large groups of eggs occur. The females do not oviposit in *Coffea schumanniana*, the berries of which have a dry pulp, but all other varieties are attacked, and all at the corona.

Under normal conditions the egg stage lasts 8–13 days, the larval stage 14–27, followed by a resting period of 6–10 days at full growth, and the pupal stage 6–11 days. Moisture is the chief factor influencing the period of adult life within the berry, which varies on an average from 50 to 80 days, with a maximum (observed in the laboratory) of 123 days.

NAVARRO DE ANDRADE (E.). **Uma praga dos bambus.** *Rhinastus sternicornis* (Germ.). [*R. sternicornis*, a Pest of Bamboos.]—*Bol. biol.*, no. 7, pp. 73–76, 1 pl. S. Paulo, 20th June 1927.

The weevil, *Rhinastus sternicornis*, Germ. (*pertusus*, Dalm.) first recorded from Brazil on *Chusquea gaudichaudi* [*R.A.E.*, A, iv, 468] has been observed on various species of bamboo. A group of the giant bamboo, *Dendrocalamus giganteus*, was, however, free from infestation, though surrounded by other varieties that were severely attacked. If the internodes are cut open and exposed to the sun the larvae quickly die; this should be done in May, before pupation takes place. The adults emerge from mid-January onwards, being most plentiful in March. The female bores into buds or shoots of the same year's growth, mature bamboos not being attacked, and lays an egg in each hole. The egg stage averages 6–10 days with an observed maximum

of 15, and the larval stage lasts about three months. The larvae may be cannibals. The longest adult life observed was 13 days; the majority of the weevils live 7-8 days after mating.

JOAN (T.). **Nota preliminar sobre la evolución de la tucura.** [Preliminary Note on the Development of *Trigonophymus arrogans*.] —*Rev. Soc. ent. argentina*, ii, no. 3, pp. 7-12, 1 pl. Buenos Aires, 30th April 1927.

Coinciding with a notable decrease of insectivorous birds, especially gulls, there has been a steady increase of the Acridid, *Trigonophymus arrogans*, Stål, in the south of the province of Buenos Aires. In the laboratory, 59 days were required from the hatching of the larva to the appearance of the winged adult. The adult and various larval stages are described. Many egg-batches contained larvae of *Epicaula adspersa*, Klug, which feed on the eggs.

ARAVENA (R. O.). **Informe sobre el *Oeceticus platensis* Berg en la localidad de Arano, F.C.S.** [Note on the Bagworm at Arano on the Southern Argentine Railway.]—*Rev. Soc. ent. argentina*, ii, no. 3, pp. 61-62. Buenos Aires, 30th April 1927.

Where the bagworm, *Oeceticus kirbyi* var. *platensis*, Berg, is very abundant and its parasite, *Parexorisista caridei*, Brèth., is insufficient to control it, the collection by hand of the bags is recommended. It is suggested that the numbers of this pest are sometimes increased in places where it was not very plentiful by means of the introduction of branches bearing bags thought to be parasitised.

OGILVIE (L.). **Some Bermuda Aphides and their Control.**—*Agric. Bull. Bermuda Dept. Agric.*, vi, no. 5, pp. 5-7. Bermuda, May 1927.

The Aphids found in Bermuda are few in number but of considerable interest and importance. Among the commonest are *Macrosiphum gei*, Koch (*Illinoia solanifolii*, Ashm.) and *Myzus persicae*, Sulz., on potatoes. A favourite food-plant of the former is the sow-thistle (*Sonchus oleraceus*); both are vectors of leaf-roll and mosaic. *M. gei* often migrates to lily leaves soon after they come up, and may perhaps carry the virus of "yellow flat" from lily to lily plant. *Aphis gossypii*, Glov., attacks the leaves of melon and cucumber during the summer and the suckers of *Citrus* trees. *A. pseudobrassicae*, Davis, infests the leaves of flowering plants. *Anuraphis* (*Aphis*) *tulipae*, Boy., attacks the bases of carrots and celery, and *Brevicoryne brassicae*, L., the centres of cabbages. *Aphis nerii*, Kalt., sometimes appears suddenly on the tips of *Oleander* and is also found on wild *Ipecacuanha*. *A. pomi*, DeG., damages the shoots of loquats. *Cerataphis lataniae*, Boisd., is found on the leaves of Bourbon palm (*Livistona chinensis*). *Asiphonella dactylonii*, Theo., causes gall-like growths on Bermuda grass [*Cynodon dactylon*]. *Pentalonia nigronervosa*, Coq., is found on the flowers, tips of the fruit and leaves of banana, and is the carrier of "bunchy-top" disease. *Aphis lilii*, Licht., which is closely related to *A. gossypii* [R.A.E., A, xiv, 626], and a black Aphid (? *Fullawayella formosana*, Tak.) probably brought from Formosa on lily bulbs, are common on lilies, the former being a carrier of "yellow flat."

Many of these Aphids are largely controlled by the natural enemies already noticed [*loc. cit.*] and the larvae of lacewing flies. On ornamental plants, nicotine dusts or nicotine sulphate sprays may be used; and in glass-houses, fumigation with calcium cyanide is advised.

Ogilvie (L.). **Aster Yellows in Bermuda.**—*Agric. Bull. Bermuda Dept. Agric.*, vi, no. 5, pp. 7–8, 1 ref. Bermuda, May 1927.

The disease known as aster yellows, which is transmitted by the leafhopper, *Cicadula sexnotata*, Fall. [*R.A.E.*, A, xv, 284] is recorded from Bermuda, where lettuce and a number of garden plants and weeds are also infected.

da Costa Lima (A.). **Sobre um novo microlepidoptero, cuja lagarta é praga das laranjeiras no Districto Federal.** [A new Microlepidopteron of which the Caterpillar is a Pest of Orange Trees in the Federal District, Brazil.]—*Chacaras e Quintaes*, xxxvi, no. 1, pp. 33–35. S. Paulo, 15th July 1927.

Oranges in the Federal District of Brazil are attacked by a Tortricid, here described as *Gymnandrosoma aurantianum*, sp. n., the larvae of which bore in the fruits. The infestation was not observed until 1925. The larval period does not appear to exceed twenty days, and the pupal ten. Pupation takes place in a cocoon in the ground.

Subsequently the author found a specimen of this moth in a collection; it had been bred from larvae taken on guava on 18th March, the adult emerging on 3rd April.

Silvestri (F.). **Sobre la mosca prieta.** [On *Aleurocanthus woglumi*.]—*Bol. Fomento*, vi, no. 1, pp. 16–18, 1 fig. San José, Costa Rica, 1927.

In Costa Rica *Aleurocanthus woglumi*, Ashby, is a very serious pest of *Citrus*. It is suggested that the Chalcid, *Prospaltella smithi*, Silv., which effectively controls *A. woglumi* in Ceylon, Singapore and China, should be introduced.

Alfaro (A.). **Algunos insectos perjudiciales.** [Some injurious Insects.]—*Bol. Fomento*, vi, no. 2, pp. 15–18. San José, Costa Rica, 1927.

Cabbages in Costa Rica are attacked by *Pieris elodia*, Boisd., which completes its life-cycle in a little over four weeks.

**Acuerdo sobre la reglamentación para el combate del "Picudo" del algodón.** [Regulations for Work against the Cotton Boll Weevil in Mexico.]—*Mexico: Sec. Agric. y Fomento, Bol. mens. Defensa agric.*, i, no. 1, pp. 14–15, 20 21. San Jacinto, D.F., January–May 1927.

Regulations dated 21st April 1927 have been issued by the Mexican Government for work against the cotton boll weevil, *Anthonomus grandis*, Boh., which is becoming a serious pest in the cotton-growing districts. Growers are required to report the presence of the weevil,

and local authorities are to see that measures, including clean cultivation, crop rotation, and dusting with calcium arsenate, are carried out, and that all cotton plants or parts of plants are fumigated or otherwise disinfected before being exported from infested districts.

**Consejos sencillos para destruir la langosta.** [Simple Instructions for destroying Locusts.]—*Mexico: Junta nac. Campaña contra la Langosta*, Bol. nos. 1, 2, 3 (2 figs.), 8 pp. each. Vera Cruz, July, September, October, 1926. [Recd. August 1927.]

These leaflets, issued by the National Junta for Locust Control, give instructions for combating the winged individuals, eggs and hoppers of *Schistocerca paranensis*, Burm., and its solitary form, *S. paranensis* ph. *americana*, Scud. [*R.A.E.*, A, xiv, 388]. The poison-bait formulae are those used in the United States. As a result of experiments the following formula is recommended for a petroleum-soap emulsion in solid form that requires dissolving in water only at the rate of 1 lb. in 2 gals.: Coconut oil 30 lb., tallow 30 lb., caustic soda 30 lb., wood-tar 1 lb., flowers of sulphur 1 lb., and refined petroleum 1 lb. The ingredients are mixed cold.

**La langosta devastadora de México.** [The devastating Locust of Mexico.]—*Mexico: Junta nac. Campaña contra la Langosta*, Bol. no. 4, 8 pp., 2 figs. Vera Cruz, November 1926. [Recd. August 1927.]

At the present time the areas where *Schistocerca paranensis*, Burm., breeds are towards the south of Mexico and in Central America. It was found that if individuals were kept in isolation from the moment of hatching, they developed into the solitary phase (ph. *americana*, Scud.), which has a protective green colouring. It is suggested that this was the original form, which owing to various factors suddenly increased and was compelled to migrate for lack of food, and that during these early migrations the two phases developed. The protective colouring of the solitary phase is unnecessary in the swarms of the migratory form. It remains to be determined why the solitary phase, which occurs in the United States, does not transform and migrate into Mexico, but it is probably due to the distance from tropical regions that is involved.

The part played as parasites by the flies, *Sarcophaga sternodontis*, Towns., *S. angustifrons*, Ald., and *Tachinophyto gilvipes*, Coq., is being investigated.

**Instrucciones para combatir la mosca de la fruta** (*Anastrepha ludens*). [Measures against the Fruit-fly, *A. ludens*.]—*Mexico: Sec. Agric. y Fomento, Ofic. Defensa agric.*, Bol. no. 3, 6 pp. Tacubaya, D.F., June 1927.

*Anastrepha ludens*, Lw., is a native of Mexico, where it seems to have infested guavas originally, passing to orange, lime, mango, plum, etc. There are four generations a year. The female lays about 70 eggs, 6-10 in each fruit in the case of a severe attack. The larva hatches in 2-3 days and has an average life of 14 days. Pupation occurs in the ground and lasts 17-25 days in hot districts. The measures advocated are the collection of all fallen fruits and their destruction after storage under a wire-gauze screen permitting the Braconid parasite, *Cratospila*

*ridibunda*, Say, to escape. The ground should be raked up and the pupae collected, or destroyed by watering with boiling water or a 12 per cent. solution of caustic soda or by spreading quick-lime and slaking it.

BIRD (R. D.). **Notes on Insects bred from Native and Cultivated Fruit Trees and Shrubs of Southern Manitoba.**—*Canad. Ent.*, lix, no. 6, pp. 124–128. Orillia, Ont., June 1927.

This list includes all the species observed during 1924–26, together with those species found previously breeding on cultivated fruits, arranged under orders and families, with notes on their food-plants and general time of occurrence in the adult stage, and, in a few cases, records of parasites.

WATSON (E. B.). **Notes on the Hibernation of the Spruce Bark-beetle, *Ips perturbatus* Eichh., in Northern Ontario.**—*Canad. Ent.*, lix, no. 5, pp. 120–121. Orillia, Ont., May 1927.

It was believed that, in common with other Scolytids, *Ips perturbatus*, Eichh. (spruce bark-beetle) hibernated in the tunnels in the bark where the eggs had matured. It has been found, however, in Ontario that the young adults leave their tunnels in September and October and enter the ground to a depth of 2 or 3 inches. They show a decided preference for decayed wood, but may also be found in numbers in dead leaves or moss, under the decaying bark of fallen trees and in similar places. Over 90 per cent. of the brood abandon their tunnels in the autumn, and only occasional individuals are to be found under the bark of the brood trees. Emergence from the hibernating quarters occurs towards the end of May, when the beetles may be seen in swarms entering windfall spruce and the tops of trees killed by *Dendroctonus piceaperda*, Hopk., in the previous year.

*Ips pini*, Say, behaves in a somewhat similar manner, 60 per cent. of the brood leaving their tunnels in autumn to hibernate in the ground beneath the pine logs in which they had been reared.

PETCH (C. E.) & ARMSTRONG (T.). ***Coleophora pruniella* Clemens; a new Pest of Apple in Quebec.**—*18th Ann. Rept. Quebec Soc. Prot. Plants, 1925–26*, pp. 93–95, 4 figs., 8 refs. Quebec, 1926. [Recd. June 1927.]

A description is given of the various stages of *Coleophora pruniella*, Clem., recently found attacking apples in Quebec. The adults emerge from the beginning of July to the beginning of August, the maximum emergence occurring about 13th July. The eggs hatch in 16–20 days. The larvae, which are case-bearers, bore through the egg-shell into the leaf tissue making a hole between the upper and lower leaf-surfaces. The egg-shell serves as a case until it is completely filled with frass. The first larvae were observed on 30th July and feeding continued until 12th October, when the larvae migrated from the leaves to the twigs, where the winter is passed. About 8th May they leave their winter quarters and migrate to the opening buds. Feeding is mostly done on the lower surface of the leaves, though the larvae may migrate to the petioles and small twigs near the injured leaves; in some cases they were found feeding on the sepals and even the young apples.

The construction of the case is described. After apple the tree most attacked was *Prunus virginiana* (choke cherry); slight injury was also done to *Crataegus* sp., and cultivated plum, cherry and pear. In the United States the only food-plant recorded is *Prunus serotina* (wild black cherry). Lead arsenate, calcium arsenate, lime-sulphur and calcium arsenate, and an oil spray were applied 4 times at the regular spraying periods without success.

The larvae and pupae are heavily parasitised. The parasites reared include *Spilochaleis torvina*, Cress., *Microbracon pygmaeus*, Prov., *Hemiteles (Orthizema) tenellus*, Say, *Eurydinota lividicarpus*, Gir., *Amblyteles funestus*, Cress., *A. comes*, Cress., and *A. subrufus*, Cress.

MAHEUX (G.). **Household Insects.**—*18th Ann. Rept. Quebec Soc. Prot. Plants, 1925-26*, pp. 96-112. Quebec, 1926. [Recd. June 1927.]

This is a popular account of the more common household pests, including the insects attacking stored products, clothes moths, cockroaches, etc., with notes on their habits and control. The methods of fumigating with sulphur dioxide, carbon bisulphide, and hydrocyanic acid gas are also described.

HUTCHINGS (C. B.). **The Shade Tree Insects of Eastern Canada for the Year 1925, with Remarks on their Activities and Prevalence.**—*18th Ann. Rept. Quebec Soc. Prot. Plants, 1925-26*, pp. 113-117. Quebec, 1926. [Recd. June 1927.]

*Paraclemensia acerifoliella*, Fitch (maple leaf-cutter) and *Glycobius speciosus*, Say (maple borer) are still causing considerable injury to sugar maple (*Acer saccharum*), the infestation by the latter amounting to as much as 75 per cent. in Quebec [*R.A.E.*, A, xiv, 172]. *Bucculatrix canadensisella*, Chamb. (birch leaf skeletoniser) is a less serious pest of birches than might be expected, as the infestation is at its height towards the end of the summer. The infestation by *Nygmia phaeorrhoea*, Don. (*Euproctis chrysorrhoea*, auct.) in Nova Scotia is being gradually reduced, only 77 nests having been collected in 1925-26 as against 154 in the previous season. About 3,000 egg-clusters of *Porthetria dispar*, L. (gipsy moth) were found in the spring of 1925 in Quebec, but as a result of the measures taken [*R.A.E.*, A, xv, 39], only 4 were found in the autumn. *Palaeacrita vernata*, Peck (spring cankerworm) occurred in several localities in Quebec, attacking maple, ash, elm, apple and pin cherry (*Prunus pennsylvanica*); in some cases the trees were completely defoliated. This outbreak was followed by one of *Nylinia antennata*, Wlk. (green maple caterpillar), which showed a distinct preference for maples, although the larvae also fed freely on shrubs and other plants. In one district elms were badly damaged by *Kaliofenusa ulmi*, Sund. (elm leaf-miner). *Hemerocampa leucostigma*, S. & A. (white-marked tussock moth) was particularly injurious in Toronto, but less so than usual in Montreal, apparently owing to the organised measures carried out by the city authorities. The tent caterpillars, *Malacosoma disstria*, Hb., and *M. americana*, F., were less abundant in New Brunswick, but increased in numbers in Quebec, attacking elm, butternut (*Juglans cinerea*), walnut, apple and cherry. *Coleophora laricella*, Hb. (larch case-bearer) was abundant throughout New Brunswick. *Diprion* (*Neodiprion*) *lecontei*, Fitch, was apparently greatly reduced in numbers by the parasite, *Exenterus diprioni*, Rohw.

*Rhyacionia buoliana*, Schiff. (European pine shoot moth), which was first discovered in Canada in the early summer of 1925 [*R.A.E.*, A, xv, 40], has been found, as a result of inspection of imported pines, to be widely distributed, and it is thought that it has been established in Canada for 12 or 13 years. *Cryptococcus fagi*, Bär. (felted beech coccus), which has become established in Nova Scotia and Prince Edward Island, is spreading and causing serious injury to beeches, which may eventually be killed. June beetles, *Lachnosterna* (*Phyllophaga*), were very abundant during the early summer, as many as 35,000 being taken in 5 light-traps in Quebec where elm, poplar, maple, willow and other shade trees were completely defoliated. The species collected in Ontario proved to be *L. (P.) rugosa*, Melsh. The leaves of white oaks [*Quercus alba*] in western Ontario were skeletonised by *Anisota senatoria*, S. & A. (yellow-striped oak caterpillar). *Vanessa* (*Aglaia*) *antiopa*, L. (spiny elm caterpillar) damaged elm and poplar in Nova Scotia. The nests of *Hyphantria cunea*, Dru. (fall webworm) occurred mainly on elm, ash and willow, the infestation being less severe than in 1924. *Lygaeonematus erichsoni*, Htg. (larch sawfly) caused severe defoliation of larches in New Brunswick and Prince Edward Island. Other shade tree pests recorded are: *Gossyparia spuria*, Mod. (elm bark aphid); *Chermes pinicorticis*, Fitch (white pine bark aphid); *Agrilus anxius*, Gory (bronze birch borer); *Monophadnus caryae*, Nort., on butternut, recorded for the first time from Eastern Canada; *Pulvinaria vitis*, L. (cottony maple scale) and *Gracilaria syringella*, F. (lilac leaf-miner).

PETCH (C. E.). **Insects of the Season in Southern Quebec for the Year 1925.**—*18th Ann. Rept. Quebec Soc. Prot. Plants, 1925-26*, pp. 117-120. Quebec, 1926. [Recd. June 1927.]

Notes are given on the prevalence and biology of a number of injurious insects in southern Quebec. *Rhagoletis pomonella*, Walsh (apple maggot) was the most destructive fruit pest, though it did not appear in any numbers until much later than usual. Next in importance was *Tachypterellus quadrigibbus*, Say (apple curculio), which was troublesome in all districts; *Conotrachelus nenuphar*, Hbst. (plum curculio), which generally attacks apples in Quebec, was much less injurious than usual. Injury to apples by *Rhabdopterus picipes*, Oliv. (cranberry rootworm beetle) occurred over a larger area than in the previous year [*R.A.E.*, A, xiv, 172], but the beetles were not in sufficient numbers to cause much loss; in one locality they occurred on a number of plants but were not found on apple.

SHORT (S. H.). **The Henrysburg Outbreak of the Gypsy Moth in Quebec.**—*18th Ann. Rept. Quebec Soc. Prot. Plants, 1925-26*, pp. 120-122. Quebec, 1926. [Recd. June 1927.]

This information concerning the measures undertaken for the control of the gypsy moth [*Porthetria dispar*, L.] has already been noticed from another source [*R.A.E.*, A, xv, 39].

BOISVERT (P.). **The Poplar and Willow Borer** (*Cryptorrhynchus lapathi* L.).—*18th Ann. Rept. Quebec Soc. Prot. Plants, 1925-26*, pp. 122-125, 7 refs. Quebec, 1926. [Recd. June 1927.]

*Cryptorrhynchus lapathi*, L., feeds on all species of willows, poplars and alders in Canada and the United States, and occasionally attacks

birch; trees from 2 to 12 years old are most liable to attack. Pairing occurs towards the end of August and beginning of September, and the eggs are laid a fortnight later in cracks in the bark. The larvae hatch in 18-20 days and immediately bore inwards until they reach the wood and then follow the circumference of the trunk or branch. Hibernation begins in October, and larval activity is resumed again at the end of April or beginning of May. Up to July the galleries are confined to the cambium; about this time the larvae enter the wood, where the gallery is enlarged to form a pupal chamber. Some 12-15 days are spent in the chamber, the adults emerging about the end of July.

All trees should be examined in the spring so that remedial measures may be undertaken before the injury becomes too great. Affected trees or branches should be cut out and burnt; when the trunk of a young tree is infested, it may be practicable to cut open the galleries and kill the borers, after which the wound in the tree should be disinfected and covered with some impermeable substance. Arsenical sprays applied towards the end of July might kill the adults. Painting the bark with an emulsion of carbolineum has been recommended for the destruction of the hibernating larvae [*R.A.E.*, A, iv, 69].

DAVIAULT (L. J.). **The Cabbage White in Quebec.**—*18th Ann. Rept. Quebec Soc. Prot. Plants, 1925-26*, pp. 126-128. Quebec, 1926. [Recd. June 1927.]

This paper on *Pieris rapae*, L., in Quebec is a translation of one published in French [*R.A.E.*, A, xiv, 389].

HUBER (L. L.). **A Taxonomic and Ecological Review of the North American Chalcid Flies of the Genus *Callimome*.**—*Proc. U.S. Nat. Mus.*, lxx, art. 14, no. 2663, 114 pp., 4 pls. Washington, D.C., 1927.

A key is given to the 104 species of *Callimome*, with a list of hosts. *Misocampus*, *Torymus* and *Syntomaspis* are treated as synonyms of this genus. The majority of the species are parasites of Hymenopterous or Dipterous gall-makers, while 5 have been recorded as either wholly or partly phytophagous.

FORBES (S. A.). **The General Entomological Ecology of the Indian Corn Plant.**—*Bull. Illinois Nat. Hist. Surv.*, xvi, art. 7, pp. 447-457. Urbana, Ill., April 1927. [Recd. July 1927.]

This is a reprint of a paper published in the *American Naturalist* in 1909. When maize was originally introduced into America, none of its native insect pests, with the possible exception of *Diabrotica longicornis*, Say, was introduced with it. The plant has no special adaptation with regard to insects; it does not depend on their agency for fertilisation, and on the other hand does not possess any special apparatus of defence against those able to injure it. It is now the common food-plant of a number of insects that as a result of various ecological factors have become adapted to it; most of the various species attack the plant in a definite sequence, with the result that neither plants nor pests are exterminated. It is, however, also attacked by a number of insect

pests that probably only occur on it accidentally, as they migrate from neighbouring vegetation, mainly grasses, and usually attack the maize when it is small, so that as a result of the scanty food-supply the entire plant succumbs.

For the purpose of comparison the insect pests of the strawberry, which is a native plant and extensively grown, are also discussed; these include a number that also feed on maize.

It is suggested that adaptations of insects to their environment are largely, and often primarily, psychological, being in the first place specialisations of preference or choice. Certain insects that would compete with each other with mutual disadvantage avoid such conditions by acquiring different habits of reaction, such as one of them selecting maize for its principal food-plant while the other continues on strawberry, though neither is structurally altered and each remains equally fit to feed on either plant.

SHELFORD (V. E.). **An Experimental Investigation of the Relations of the Codling Moth to Weather and Climate.**—*Bull. Illinois Nat. Hist. Surv.*, xvi, art. 5, pp. 311-440, 33 figs., 71 refs. Urbana, Ill., March 1927. [Recd. July 1927.]

The author explains the importance of being able to determine the probable date of appearance of the codling moth [*Cydia pomonella*, L.], the time of emergence of the adults, seasonal progress and moment of pupation. The method of studying these problems is described, and the purpose of the present investigation is outlined. It indicates that various factors besides temperature have important effects on development; that experimental results may be made to have direct bearing on the interpretation of results under actual climatic conditions; that the temperature at which development begins is variable, and that the approximations used by various workers in summing temperatures are of little or no physiological significance; that under actual climatic conditions there is no such thing as a "thermal constant" or "sum of temperatures" in the ordinary biological sense, and that the temperature should not be summed without various corrections and adjustments for the effects of other factors; that interpretations of conditions may be based on equal-velocity charts for combinations of important factors; that conditions of hibernation are of great importance; and that rainfall and many other factors are of importance at particular periods of life-history. The experiments undertaken and the conclusions deduced from them are discussed at length and should be studied in the original. Temperatures, when read for biological purposes, should be taken every hour or two instead of daily and corrected for other conditions. The time of pupation in spring and length of the pupal stage of *C. pomonella* are influenced by autumn and winter rainfall. Rainfall-temperature diagrams (hythergraphs) show characteristic differences between years when *C. pomonella* is abundant and years when it is scarce. Rainfall influences the time spent by the larva in the apple, and probably the length of other stages. The falling of the mean temperature from day to day in late summer induces acceleration of development, while its rise in spring is correlated with decreased rate of development. This falling of mean temperature has no influence on the beginning of hibernation, which is probably induced by the activity of enzymes. There is considered to be no reliable basis for predicting the time of the first spring pupation.

SPOONER (C. S.). **A Study of the Catalase Content of Codling Moth Larvae.**—*Bull. Illinois Nat. Hist. Surv.*, xvi, art. 6, pp. 443-446, 1 ref. Urbana, Ill., March 1927. [Recd. July 1927.]

Experiments described in this paper show that the larvae of the codling moth [*Cydia pomonella*, L.] contain large quantities of the enzyme catalase, that the amount present varies considerably in different individuals and is directly correlated with the health and life of the larva, and that it may also be directly correlated with pupation and dormancy. To test this, experiments should be made covering each day of larval life from the time of leaving the apple until pupation.

REINHARD (H. J.). **The Influence of Parentage, Nutrition, Temperature, and Crowding on Wing Production in *Aphis gossypii*, Glover.**—*Texas Agric. Expt. Sta.*, Bull. 353, 19 pp., 8 refs. College Station, Tex., April 1927. [Recd. July 1927.]

During a period of 12 months, 59 complete generations of wingless agamic forms of *Aphis gossypii*, Glov., were reared on cotton in the laboratory. The results of the experiment are described, the following being taken mainly from the author's summary and conclusions.

The normal tendency of this Aphid is to be wingless, the production of wings being entirely dependent on environmental influences. Starvation increases the number of alate individuals in the progeny of apterous parents, but does not appear to have any influence on the production of alate forms in the progeny of alate parents, which revert to the normal tendency of the species, i.e., the production of apterous forms; this is so marked that the effect produced by starvation in stimulating wing development is practically if not entirely counteracted. There is no correlation between temperature and ratio of forms produced, with mean temperatures ranging from 70° to 90° F. Winged forms appeared in isolated cases, but were attributable to crowding, which, even though there may be an abundance of food, is a very powerful if not the dominant or controlling factor in stimulating wing development in this species. The prevailing relative humidity at which the Aphids are reared does not influence the ratio of winged and wingless forms.

REINHARD (H. J.). **Control and Spring Emergence of the Cotton Flea Hopper.**—*Texas Agric. Expt. Sta.*, Bull. 356, 32 pp., 10 figs. College Station, Tex., April 1927. [Recd. July 1927.]

Owing to the extensive injury to cotton in Texas by the cotton flea-hopper [*Psallus seriatius*, Reut.], a series of experiments was undertaken in 1926 with a number of dust or liquid materials as insecticides against it. The results are shown in a series of tables. In field experiments, superfine dusting sulphur, flowers of sulphur, a dust consisting of 60 parts superfine dusting sulphur, 20 parts finely ground tobacco dust and 20 parts of hydrated lime, and sulphur-tobacco dust (60 : 40) all killed from 68 to 75 per cent. of the insects, and, used at the rate of 20 lb. to the acre, remained effective for 6 or 7 days under favourable climatic conditions. The sulphur-tobacco dust was the most effective. The dusts should be applied by machine, the first application being made at the time when cotton plants would normally begin to form squares. Similar experiments were made with a number of proprietary liquid insecticides and lime-sulphur, but none of these was effective. Data

on the hatching of the overwintering eggs of *P. seriatus* in spring have been collected; during 1926 it extended over 13 weeks, with the maximum in mid-April. The importance of destroying winter food-plants and spring weeds is therefore obvious. A list of 16 food-plants additional to that already noticed [*R.A.E.*, A, xiv, 630] is given, including chiefly early spring weeds growing in or near to fields of young cotton. Goatweed [*Croton* spp.] is the most important food-plant; cotton stalks and horse-nettle (*Solanum elaeagnifolium*) are also frequently infested. Ploughing the food-plants under during the winter and destroying the spring weeds are strongly recommended [A, xiv, 631]. Wind may possibly be a factor in dispersal of the insects to uninfested fields early in the season. No natural enemies of this Capsid have been found.

**Quarantine on account of Gypsy Moth and Brown-tail Moth. Revised Rules and Regulations supplemental to Notice of Quarantine no. 45.**—*U.S. Dept. Agric., Fed. Hortic. Bd.*, 6 pp., 1 map. Washington, D.C., June 1927.

These regulations, which came into force 1st July 1927 and supersede previous ones [*R.A.E.*, A, xv, 3], revise the areas designated as infested with *Porthetria dispar* and *Nygmia phaeorrhoea* (*Euproctis chrysorrhoea*) and add a clause with respect to the inter-state movement of living trees and plants not grown in nurseries.

**Narcissus Bulb Quarantine. Revised Regulations under Notice of Quarantine no. 62.**—*U. S. Dept. Agric., Fed. Hortic. Bd.*, 7 pp. Washington, D.C., 15th April 1927.

These revised regulations directed against the bulb flies, *Merodon equestris*, F., and *Eumerus strigatus*, Fall., and the Nematode *Tylenchus dipsaci*, Kühn [cf. *R.A.E.*, A, xiv, 492], which came into force 25th April 1927, modify the requirements of certification for inter-state movement of untreated narcissus bulbs.

**Notice of Removal of Permit Requirements for Entry of Walnuts and Filberts from Europe.**—*U.S. Dept. Agric., Fed. Hortic. Bd.*, 1 p. Washington, D.C., 1st June 1927.

A previous notice [*R.A.E.*, A, xiv, 628] is modified to permit the importation, subject to examination where deemed necessary, of walnuts and filberts from Europe.

**Modification of Quarantine on account of the European Corn Borer and other dangerous Insects and Plant Pests. Amendment no. 1 to Revised Rules and Regulations supplemental to Notice of Quarantine no. 41 (2nd Revision.)**—*U.S. Dept. Agric., Fed. Hortic. Bd.*, 2 pp. Washington, D.C., 5th July 1927.

In addition to the articles, the import of which into the United States is already permitted [*R.A.E.*, A, xv, 192], green sweet corn or sugar corn in the ear may be imported under permit if accompanied by satisfactory evidence of freedom of the place of origin from *Pyrausta nubilalis*, Hb., and other pests and diseases.

GUI (H. L.). **The Cabbage Maggot and its Control.**—*Bimthly. Bull. Ohio Agric. Expt. Sta.*, xii, no. 3, pp. 92-99, 3 figs. Wooster, Ohio, May-June 1927.

*Phorbia* (*Hylemyia*) *brassicac*, Bch. (cabbage maggot) is one of the most serious pests of cabbage in Ohio. An account is given of its life-history and habits, and the usual remedial measures, such as cultural practices, mechanical protection of the plants and the use of insecticides, are discussed. Mercury bichloride should be used at the rate of 1 oz. to 10 U.S. gals. water for cabbages, and at the rate of 1 oz. to 12½ U.S. gals. water for the more tender plants, such as cauliflower. A stock solution may be prepared by adding 4 oz. mercury bichloride to 1 U.S. gal. water, each U.S. quart being thus equivalent to 1 oz. of the dry material. A more concentrated stock solution may be made by dissolving 5 oz. mercury bichloride powder in 4 U.S. fl. oz. hydrochloric acid. A total of 5 U.S. fl. oz. of stock solution is thus obtained, 1 U.S. fl. oz. of which is equivalent to 1 oz. of dry mercury bichloride. This acid solution should not be used on cauliflower or other tender plants. The stock solution should be stored in glass, wooden or earthenware vessels owing to its rapid corrosive action.

FROST (S. W.). **The Dusky Leaf Roller.**—*Pennsylvania Agric. Expt. Sta.*, Bull. 205, 15 pp., 11 figs., 14 refs. State College, Pa., August 1926. [Reed. July 1927.]

During recent years serious losses have resulted from the attack of *Amorbia humerosana*, Clem. (dusky leaf-roller) on apples in Pennsylvania, 80 per cent. of a crop being destroyed in one instance. A brief history of this moth, which is indigenous to North America, is given. In addition to apple, the larvae feed on *Rhus* spp., spice bush (*Benzoin aestivalis*), pine, huckleberry (*Gaylussacia*), *Solidago*, *Alnus* and *Castanea dentata*. It is common but rarely abundant in the north-eastern United States and has been recorded from Ontario. The larvae make tubular shelters by rolling the edges of the apple leaves and frequently consume a considerable amount of the edges of their tubes before attacking the adjacent fruit and foliage. The deep cavities made in the fruit seriously affect its quality. Sometimes they leave their shelters and build new ones, but are seldom found exposed. All stages of the insect are described. The eggs are laid during May and June in compact masses, containing an average of 65 eggs, protected and cemented to the upper surface of the leaf by a milky white secretion. Several batches of eggs are laid by a single female, but seldom on the same leaf. The larvae hatch in about two weeks, the majority emerging in June. The larval period lasts about two months, pupation taking place during August and September, so that the period of injury to the fruit is extended, and early varieties are attacked to a greater extent than later ones. The adults begin to emerge about the middle of April from the hibernating pupae, which may be found in large numbers beneath dry leaves and other rubbish in the orchards. Three species of parasitic Hymenoptera have been reared from the larvae, *Epirhysalus atriceps*, Ashm., *Glypta phoxopteridis*, Weed, and what is probably an undescribed species of *Glypta*. No extensive experiments have been made on the control of this leaf-roller, but since oviposition does not begin until about the end of May, the regular spring arsenical sprays are obviously ineffective, and dormant oil sprays would be useless because

the insect hibernates beneath leaves under the trees. Thus summer and early autumn applications of lead arsenate seem to offer the only means of control. In one test a heavy application of lime-sulphur and lead arsenate dust was made just before picking time. The majority of the larvae disappeared, and in the following year the percentage of larvae in the orchard was very small.

TRANSEAU (E. N.). **Vegetation Types and Insect Devastations. Distribution of the Mexican Bean Beetle and European Corn Borer in Ohio.**—*Ecology*, viii, no. 3, pp. 285–288. Brooklyn, N.Y., July 1927.

The principal results of the author's studies on the relation between the types of primitive vegetation and the present distribution of the Mexican bean beetle [*Epilachna corrupta*, Muls.] and the European corn borer [*Pyrausta nubilalis*, Hb.] in Ohio have been noticed from other sources [*R.A.E.*, A, xv, 393, 439]. The latter causes serious damage in areas originally dominated by the series of associations from *Phragmites* marsh to swamp forest. The infestation is much less in areas originally covered with beech-maple forest and least in those that were formerly oak-hickory forest.

Vegetation maps made by plant ecologists may be more valuable to agronomists and foresters than soil surveys in that they represent an evaluation of soil and atmospheric conditions.

CARTER (W.). **Population of *Eutettix tenella* Baker and the osmotic Concentrations of its Host Plants.**—*Ecology*, viii, no. 3, pp. 350–352, 1 fig. Brooklyn, N.Y., July 1927.

Summarising his observations the author concludes that extremely high sap concentrations are avoided by *Eutettix tenella*, Baker (sugar-beet leafhopper), if more suitable food is available. This was true in a small area where two growth forms of the same species of plant were present, the higher concentration forms being abandoned for those having a lower concentration. Moreover should another food-plant appear that has a more suitable concentration, the original plant is abandoned and the new one supports the greater population. Whether concentration of the sap of the food-plant can be considered a real factor in the ecology of the insect, or whether it simply gives a measure of succulence, has yet to be determined.

SEVERIN (H. H. P.). **Crops naturally infected with Sugar Beet Curly-top.**—*Science*, lxvi, no. 1701, pp. 137–138, 3 refs. New York, N.Y., 5th August 1927.

Curly-top of sugar-beet, transmitted by *Eutettix tenella*, Baker, has caused enormous loss in the western part of the United States, and unless efficient parasites of the leafhopper can be imported, or a beet resistant to the disease can be developed, the industry in many parts of this area will perish. It is found that when sugar-beet is seriously infected, other crops also become naturally infected with the same disease, and a list of these is given. To determine whether plants had been naturally infected, leafhoppers that had been non-infective for many generations were fed on stunted, diseased plants removed from the field and then transferred to sugar-beet. If the beet developed

curly-top, it was evident that the original plants had been naturally infected. Cross inoculations with non-infective insects fed on healthy crops or weeds failed to transmit the disease. This method shows that numbers of field and garden beans in California are naturally susceptible to the disease.

Curly-top of sugar-beet and western yellow blight of tomatos are both more severe in the natural breeding areas of the beet leafhopper in the San Joaquin and Salinas Valleys than in the coastal regions. During 1925 and 1926 non-infective beet leafhoppers after feeding on tomato plants affected with western yellow blight transmitted curly-top to sugar-beet. Curly-top was also transmitted from tomatos showing symptoms only of mosaic, showing that the tomatos were also naturally infected with the causal agent of curly-top.

KNOWLTON (G. F.). **Notes on a few *Amphorophora* (Aphididae) of Utah.**—*Pan-Pacific Ent.*, iii, no. 4, pp. 185–186, 1 ref. San Francisco, Cal., April 1927.

The following species of *Amphorophora* were taken in Utah in 1925: *A. nervata*, Gill., on cultivated and wild roses; *A. rubi*, Kalt., on strawberries; *A. nigricornis*, sp. n., on *Polygonum persicaria*; and *A. halli*, sp. n., on the lower surface of leaves of birch (*Betula fontinalis*). The new species are described from winged viviparous females.

ESSIG (E. O.). **Some Insects from the Adobe Walls of the Old Missions of Lower California.**—*Pan-Pacific Ent.*, iii, no. 4, pp. 194–195. San Francisco, Cal., April 1927.

In the course of dissolving in water old adobe bricks used in constructing mission stations in the latter part of the eighteenth century, with a view to studying the seeds in use at that time in Lower California, certain insects were discovered, including *Calandra* (*Sitophilus*) *granaria*, L., and *C. (S.) oryzae*, L. The author considers this to be evidence that these weevils were introduced into Lower California by the Mission Fathers in 1769.

KNOWLTON (G. F.). **A new Willow Aphid from Utah.** *Pan-Pacific Ent.*, iii, no. 4, p. 199. San Francisco, Cal., April 1927.

*Neothomasia salicinigra*, sp. n., the winged and apterous viviparous females of which are described, was found in Utah in 1925 feeding upon the bark of the smaller twigs of willow, attended by ants (*Formica rufa*, L.). The points of difference between this species and *N. populicola*, Thom., which is common in Utah, are discussed.

CROWELL (M. F.). **The European Corn Borer. The Relation of the Larvae to Submergence.**—*New Hampshire Agric. Expt. Sta.*, Tech. Bull. 30, 20 pp., 7 figs., 4 refs. Durham, N.H., June 1926. [Recd. June 1927.]

These observations were carried out in New Hampshire from the winter of 1924 to the spring of 1926. The structure of the spiracles and tracheal system of the larva of *Pyrausta nubilalis*, Hb., are described, and the relation of this structure to submergence is discussed. The technique employed in the experiments on submergence is described.

Experiments were also carried out with larvae of other species, such as *Malacosoma americana*, F., and various cutworms, all of which died after being submerged for 24 hours. Dissection of these larvae showed that submergence does not necessarily close the tracheal system. From unpublished data made available by Caffrey, it appears that hibernating larvae of *P. nubilalis* may survive submergence for 100 days or more within the maize stalks. The author's observations show that hibernating larvae can withstand periods of submergence in water from 6 to 7 times as long as can the active larvae, apparently owing to the fact that the tracheal apparatus is closed during the period of hibernation; but this is not sufficient to account for the survival after prolonged submergence in the stalks, which is probably due to the fact that a considerable time elapses before a submerged stalk becomes saturated with water. Experiments with hibernating larvae and those about to enter hibernation indicate that these larvae will not survive more than 15 days of actual submergence without being in maize stalks; the tracheal closing apparatus does not prevent the entrance of liquids into the tracheal system after a period of submergence of much more than 10 days, after which time liquids apparently leak through the closed apparatus. A comparative study of *Nygmia phaeorrhoea*, Don. (*Euproctis chrysorrhoea*, auct.) shows that the hibernating larvae of this species also are able to withstand longer periods of submergence than the active larvae.

O'KANE (W. C.) & LOWRY (P. R.). **The European Corn Borer. Life History in New Hampshire, 1923-1926.**—*New Hampshire Agric. Expt. Sta., Tech. Bull. 33*, 39 pp., 6 charts, 1 ref. Durham, N.H., February 1927. [Recd. June 1927.]

This detailed account of the life-history of *Pyrausta nubilalis*, Hb., in New Hampshire is a result of observations extending over four years. There are two distinct phases, one with two generations a year and the other with one. The number of generations is determined by the time of the emergence of the larvae of the first generation. During 1924 larvae that hatched up to 20th July completed their development and produced a second generation, the first larva of which hatched about 17th August. All the larvae of the first generation hatching after 20th July completed their larval development and entered hibernation, whereas most of those of the second generation succumbed to climatic conditions, as their development was not sufficiently advanced. Hibernation occurs in the fifth instar, and the average length of the larval period of the second generation to the fourth moult during the four years' observations was 38 days. The period of the hatching of larvae that produce the two generation phase varies within a few days in different years and may even slightly overlap with the period of hatching of the one generation phase. As, however, the greater number of larvae produce the two generation phase in New Hampshire, there is a considerable winter mortality, so that *P. nubilalis* is not such a serious pest as might be expected. A somewhat longer growing season, such as prevails in Massachusetts, is highly advantageous to the species and would permit the larvae of the two generation phase to enter hibernation successfully. The occurrence of a season or a series of seasons more favourable than those of the past four years might increase the destructive possibilities of this insect in New Hampshire.

A number of tables are given showing the duration of the various stages of the two generations, as well as charts illustrating the life-cycle for the different years under review.

POTTS (S. F.). **The Alimentary Canal of the Mexican Bean Beetle.**—*Ohio Jl. Sci.*, xxvii, no. 3, pp. 127–137, 2 pls., 13 refs. Columbus, Ohio, May 1927.

This is a detailed account of the general anatomy and structure of the alimentary canal of *Epilachna corrupta*, Muls., which has apparently not been dealt with by previous authors.

GARMAN (H.). **Two important Enemies of Bluegrass Pastures.**—*Kentucky Agric. Expt. Sta.*, Bull. 265, pp. 29–47, 4 figs., 1 ref. Lexington, Ky., February 1926. [Recd. June 1927.]

An inspection of pastures in Kentucky in April 1925, consequent upon the failure of the seed crop after dry weather in the early spring, revealed the presence of the Capsid, *Miris dolobratus*, L. (bluegrass plant bug), and the Aphid, *Toxoptera graminum*, Rond. (green bug), causing damage to bluegrass (*Poa pratensis*). The crop, which was harvested in June, represented only about 14 per cent. of the average yield, though the seeds actually gathered were of good quality. The history of *M. dolobratus* in Kentucky and in the United States is discussed [*R.A.E.*, A, vii, 77]. The insect is dimorphic, and while its short-winged form predominates in the north and east, accounting for its slow spread in the northern latitudes, nearly 50 per cent. of the females found in Kentucky are of the long-winged form. Its dispersal southward is thus likely to be more rapid, and it will probably occupy the whole of Kentucky within a short period, spreading quickly to the States south and west where bluegrass is grown.

In 1925 the newly-hatched Capsids were common on bluegrass by 21st April. After 1st June adults only were found; they continued to oviposit until the middle of the month, when they disappeared. Contrary to the observations made by Osborn [*loc. cit.*] no evidence has been obtained indicating that *M. dolobratus* attacks any plant but *P. pratensis*, though plantings of timothy grass [*Phleum pratense*] were situated in the vicinity of infested bluegrass. *Nabis ferus*, L., is useful in destroying the Capsids. Getting rid of old growths of stems to destroy the eggs is the only practical method of reducing injury, and this is best carried out by close grazing over infested pastures.

*T. graminum* was found to be responsible for a considerable share in the damage caused to the grass crop, and was present in large numbers in April, many of the Aphids being winged. By May it had disappeared, having probably migrated to other food-plants, though a search in the neighbourhood failed to reveal its presence, nor had it returned to the bluegrass when it was inspected in October. *T. graminum* was found to be attacked by a parasitic fungus (*Empusa* sp.), and the Coccinellid, *Hippodamia parenthesis*, Say, and Syrphids were predacious on it. Its spread may be checked by the suppression of self-sown wheat and oats, and at the beginning of an infestation in a restricted area one of the sprays usually employed against Aphids might be of value.

Other insects found injuring the bluegrass crop included: *Chaetocnema pulicaria*, Melsh.; *Meromyza americana*, Fitch; the leafhoppers, *Deltocephalus sayi*, Fitch, *D. inimicus*, Say, *Stirellus* (*Athysanus*)

*curtisi*, Fitch, and *Draeculacephala* (*Diedrocephala*) *mollipes*, Say; the tarnished plant bug [*Lygus pratensis*, L.]; *Stenotus* (*Oncognathus*) *binotatus*, F.; *Plagiognathus obscurus*, Uhl.; *Reuteroscopus ornatus*, Reut.; thrips; grasshoppers, including *Orchilimum* sp., *Melanoplus femur-rubrum*, DeG., and *Chortophaga viridifasciata*, DeG.; and the mite, *Bryobia praetiosa*, Koch (*pratensis*, Garm.).

HOOD (J. D.). **A Contribution toward the Knowledge of New York Thysanoptera, with Descriptions of new Genera and Species. II.**—*Ent. amer.*, vii (N.S.), no. 4 (March 1927), pp. 209–245, 2 pls. Brooklyn, N.Y., 14th June 1927.

Among the Thysanoptera dealt with are several European species that are recorded for the first time from America and a number of new ones.

*Thrips nigropilosus*, Uzel (*lactucae*, Beach) is frequently a serious pest of chrysanthemums in greenhouses. In early spring while the snow is still on the ground, winged individuals may be found at the base of the leaves of *Verbascum thapsus* out of doors.

**Factors determining northern Limits of *Anticarsia gemmatilis*.**—*Florida Ent.*, xi, no. 1, pp. 10–12. Gainesville, Fla., April 1927.

The larvae of the Noctuid, *Anticarsia gemmatilis*, Hb. (velvet-bean caterpillar) feed extensively on velvet beans (*Stizolobium*) and also on soybean [*Glycine hispida*], kudzu bean [*Pueraria hirsuta*], *Canavalia* and peanut [*Arachis hypogaea*]. The moth is, however, unable to establish itself permanently in northern Florida and other southern States. This is not due to the direct action of cold, but to the fact that a heavy frost kills all the food-plants of the larvae; and although the pupal period may be prolonged from 11 days (in September) to 48 days (November-January), it is never prolonged sufficiently to tide over the starvation period. A very little further lengthening of the pupal period would serve to extend the northern limits of its occurrence.

RYERSON (K.). **Culture of the Oriental Persimmon in California.**—*California Agric. Expt. Sta.*, Bull. 416, 63 pp., 20 figs., 30 refs. Berkeley, Cal., January 1927. [Recd. June 1927.]

The oriental persimmon (*Diospyros kaki*) is on the whole very free from both insect pests and diseases in California. Among those occurring, *Pseudococcus citri*, Risso (citrus mealybug) is becoming increasingly prevalent in the orchards of southern California. This insect can be kept in check by exterminating the Argentine ant [*Iridomyrmex humilis*, Mayr], which drives away its enemies. Spraying during the dormant season with oil emulsion or crude carbolic-acid emulsion also helps in reducing the numbers. Occasionally *Schizura concinna*, S. & A. (red-humped caterpillar) attacks the trees and may defoliate them if unchecked; 2 lb lead arsenate to 50 U.S. gals. water is recommended as a spray. In the extreme southern part of the State the ripening fruit is injured by a Cicadid, *Tibicen cinctifera*, Uhler, which emerges from June to September; dates are protected from this insect by means of bags, and a similar measure may be necessary if the cultivation of persimmons becomes important in this area. Minor pests include *Coccus hesperidum*, L. (soft brown scale); *Saissetia oleae*, Bern. (black

scale); *Aspidiotus perniciosus*, Comst. (San José scale); *Ceroplastes cirripediformis*, Comst. (barnacle scale); and *Lepidosaphes ulmi*, L. (oyster-shell scale).

In view of the fact that the Aegeriid, *Sannina uroceriformis*, Wlk. (persimmon borer) has been intercepted in persimmon trees from the Southern States, where it is the most serious pest of persimmons, restrictions have been placed on the importation of these trees into some counties of California from certain States. Persimmons in the Southern States are also attacked by the Buprestid, *Dicerca obscura*, F., which can be removed from the trees with a stiff wire or cut out with a knife. In Florida the pests of persimmon include *Oncideres cingulatus*, Say, which is particularly injurious, *Aulacaspis pentagona*, Targ., and *Dialeurodes citri*, R. & H. Extensive damage to persimmons in Australia has been caused by *Ceratitis capitata*, Wied. (Mediterranean fruit-fly), and in Japan the Tineid, *Kakivoria flavofasciata*, Nag., is a serious pest in certain districts [*R.A.E.*, A, vi, 449].

**Section of Plant Quarantine and Inspection.**—*Jl. Econ. Ent.*, xx, no. 3, pp. 447–496. Geneva, N.Y., June 1927.

This series of papers includes: The Effect of the Supreme Court Decision of 1st March 1926 in the Case of the Oregon-Washington Railroad and Navigation Company *vs.* the State of Washington on the Basic Quarantine Laws of the various States, by C. L. Marlatt; The Plant Inspection Service of Canada, by L. S. McLaine; Advantages and Disadvantages in the Use of Printed Certificate Tags, by S. B. Fracker; The Inspection of Vehicular Traffic as practised in the Enforcement of the Japanese Beetle Quarantine, by C. W. Stockwell; Inspection of Vehicular Traffic in Enforcement of the European Corn Borer Quarantine, by L. H. Worthley; and Results of Three Years' Experience in the Control of Mosaic in Red Raspberries in Nurseries, by A. G. Ruggles and J. D. Winter.

As a result of the work described in the last paper there has been a consistent reduction in the percentage of mosaic disease amongst red raspberries in Minnesota. The measures recommended are careful inspection and marking of diseased plants each month from June to September, with two additional official inspections, the first between 1st June and 15th July, and the second between 15th July and 15th September, but not less than 30 days after the first. Infected bushes are to be dug out at once, including all roots and sucker plants; if Aphids are present the plants are to be burned before digging up, for which a hand sprayer with kerosene may be used. In plantings more than 3–4 months old, the bushes within 3 ft. of the infected plants must be dealt with in the same manner. Roguing is not practicable in plantings over a year old in which more than 5 per cent. mosaic is found. Uninfected plants cannot be successfully grown if planted at a distance of less than 20 rods from infected ones. In selecting a site for planting, it is best to choose an open or exposed upland situation, as Aphids are more numerous in sheltered places. A contact insecticide, applied at regular intervals during the growing season, might reduce the number of insects sufficiently to retard the spread of mosaic, but it is not certain whether under Minnesota conditions this treatment would be of sufficient value to justify the expense.

In the discussion following these papers the application of a number of quarantine regulations, particularly with reference to the European corn borer [*Pyrausta nubilalis*, Hb.] and the proposed State appropriation [cf. *R.A.E.*, A, xv, 502], were discussed. The other pests dealt with included the gipsy moth [*Porthetria dispar*, L.] and the Japanese beetle [*Popillia japonica*, Newm.].

**Section of Apiculture.**—*Jl. Econ. Ent.*, xx, no. 3, pp. 496-536. Geneva, N.Y., June 1927.

This section includes the following papers: The Need of a National Beekeepers Organization, by J. I. Hambleton; Gaseous Chlorine as a Disinfectant for American Foulbrood infected Combs, by R. Hutson; The relative Sensitivity of Honeybees to Light of Different Wavelengths, by L. M. Bertholf; The Fertilization and Hibernation of Queen Bumblebees under Controlled Conditions (*BREMIDAE*: Hym.), by T. H. Frison; and Demonstration of Instrumental Insemination of the Queen Bee, by L. R. Watson.

MORRILL (A. W.). **Observations on *Bucculatrix gossypiella*, a new and important Cotton Pest.**—*Jl. Econ. Ent.*, xx, no. 3, pp. 536-544, 3 pls., 8 refs. Geneva, N.Y., June 1927.

*Bucculatrix gossypiella*, Morrill [*R.A.E.*, A, xv, 394] occurs in various localities along the north-western coast of Mexico, all of which are less than 100 feet above sea-level. The characters differentiating the various stages of this species from those of *B. thurberiella*, Busck, are enumerated; the larvae may also be easily distinguished by their feeding habits. In the case of *B. gossypiella* they enter the plant tissue directly from the egg, which is laid on any exposed part of the cotton plant. In leaf blades the larva circles round the point of entrance and eventually makes its way along a branch vein to the main vein or to the junction of the blade and leaf petiole. Although observations are not yet conclusive, it appears that most of the larvae developing in parts of the plant other than the bolls and buds come to the surface at the end of the second larval instar and then feed externally on the leaf, much as do the larvae of *B. thurberiella*. Those entering the carpels of the bolls complete their larval development before coming to the surface, but they do not penetrate the inner wall into the interior of the boll. In the stem the larvae feed on the succulent parts just outside the woody tissue, though they may penetrate to the pith. The larvae emerging from their burrows at the end of the second instar spin moulting cocoons, which are commonly found on the stems. The pupating cocoons are difficult to find; some occurred on dead leaves, but the usual situation is not known.

A normal cotton plant may be heavily infested without appreciable damage except to the bolls; the end of the growing shoots may be stunted, but as the pest does not occur in destructive numbers until September such stunting is of little importance. Slight staining of the lint may occur, but such marks usually disappear soon after the bolls open, owing to the bleaching effect of sunlight. In the Yaqui Valley the number of bolls damaged usually amounts to between 10 and 30 per cent. of the crop. This may be reduced by avoiding early

planting, which only gives the insect an opportunity of establishing itself in the field before climatic conditions are favourable for the cotton plant. April and May appear to be a more favourable time for planting cotton than February or March from the point of view of controlling both this pest and *Anthonomus grandis* var. [R.A.E., A, x, 73]. Should further investigations confirm this, an attempt will be made to secure a Government regulation prohibiting the planting of cotton before 15th April and requiring the destruction of cotton stalks before 15th January or some other specified date.

FLANDERS (S. E.). **An Infestation Index for Fruit Pests.**—*Jl. Econ. Ent.*, xx, no. 3, p. 544. Geneva, N.Y., June 1927.

The author considers that it is essential in studies on the control of pests to estimate the relative numbers of the pest occurring in a given area as well as the percentage of infestation in the crop. For example, the determination of the percentage of walnuts infested with codling moth [*Cydia pomonella*, L.] will show the losses from year to year, but will not demonstrate the variation in the numbers of the moths from one year to another. Such yearly variations as well as variations between one given area and another during the same year cannot be determined by estimating the crop infestation only. An index of the numbers of a pest in any area under cultivation may, however, be determined by multiplying the average yield per acre by the percentage of infested fruit. During favourable seasons, such as 1925, the average yield of walnuts in a certain district is 2,000 lb. to the acre; in 1926 it dropped to 800 lb. If, then, the moth population in that district for those two years is represented by the index number 200, the degree of crop infestation in 1925 would be 10 per cent. and in 1926, 25 per cent.

THOMAS (F. L.). **The Orange Maggot, *Anastrepha ludens* Loew.**—*Jl. Econ. Ent.*, xx, no. 3, pp. 544-545. Geneva, N.Y., June 1927.

Though the presence of *Anastrepha ludens*, Lw., was only discovered in the spring of 1927, it is apparently widely distributed and well established in the citrus groves of the Lower Rio Grande Valley of Texas. The preceding winter had been unusually mild. The groves should be thoroughly cleared of all fallen or decayed fruit, which should be burnt or soaked in oil until all the larvae are killed.

WILSON (C. C.). U.S. Bur. Ent. **Non-arsenicals for Grasshopper Control.**—*Jl. Econ. Ent.*, xx, no. 3, p. 545. Geneva, N.Y., June 1927.

In these laboratory experiments grasshoppers in the second and third instars were used. Sodium fluoride or sodium fluosilicate was mixed with hydrated lime or gypsum at the rate of 1 : 5, 1 : 10, and 1 : 15 lb. and applied to fresh lucerne with a hand duster. In experiments at a temperature of 109° F. all grasshoppers were killed in 3-4 hours, except those poisoned with sodium fluoride and hydrated lime at the rate of 1 : 10 and 1 : 15, of which 98 and 96 per cent. were killed respectively. Additional experiments at temperatures of 89° and 96° F. gave negative results.

**Spray Recommendations for Codling Moth Control for Washington 1927.**—*Jl. Econ. Ent.*, xx, no. 3, pp. 546-547. Geneva, N.Y., June 1927.

The information contained in this summary of recommendations for the control of the codling moth [*Cydia pomonella*, L.] in Washington has already been noticed from another source [*R.A.E.*, A, xv, 300].

MUESEBECK (C. F. W.) & DOHANIAN (S. M.). **A Study in Hyperparasitism, with particular Reference to the Parasites of *Apanteles melanoscelus* (Ratzeburg).**—*U.S. Dept. Agric.*, Dept. Bull. 1487, 35 pp., 10 figs., 38 refs. Washington, D.C., April 1927.

This bulletin briefly reviews the general aspects of hyperparasitism, and discusses in particular the habits, biology and inter-relationships of the hyperparasites affecting *Apanteles melanoscelus*, Ratz., which is a valuable primary parasite of the gipsy moth [*Porthetria dispar*, L.] in the United States. Practically no primary parasites escape the attacks of hyperparasites, the extent to which they are affected depending chiefly upon the degree of their exposure or concealment while in the cocoon or puparium and upon the time spent in this stage. The second generation larvae of *A. melanoscelus* remain in cocoons, most of which are in exposed positions, during much of the period in which hyperparasites are active and thus are extremely heavily parasitised. Other parasites, on the contrary, such as *A. lacteicolor*, Vier., a parasite of the brown-tail moth [*Nygmia phacorrhoea*, Don.], spend a long hibernation period as immature larvae within the body of the host and, upon completing their development in the spring, form cocoons in situations quite inaccessible to hyperparasites. Hyperparasites are generally much less discriminative than primary parasites, and are thus able to maintain themselves in large numbers irrespective of the periodic fluctuations of particular hosts. This fact renders the establishment of primary parasites in fresh localities somewhat difficult, as the secondary parasites native to the country may attack them as readily as they do native species. In addition to the external feeding of the larvae of hyperparasites on the body of the host, the adults in many cases feed at the puncture holes made by the ovipositor and in this way destroy many primary parasites. Hyperparasites probably without exception can reproduce parthenogenetically, males in nearly all cases being the result; with a few species, however, such as *Hemiteles tenellus*, Say, *Anastatus pearsalli*, Ashm., *Eupelminus saltator*, Lind., and *Pleurotropis nawai*, Ashm., all of which are parasitic on *Apanteles melanoscelus*, only females are produced.

The life-cycle of *A. melanoscelus* is described [*R.A.E.*, A, x, 404], and an account is given of the biology of more than 30 species of its hyperparasites reared during the course of the present study. About 90 per cent. of the total parasitism of *A. melanoscelus* is caused by 14 of these, by far the most important being *Eurytoma appendigaster*, Swed., *Dibrachys cavus*, Wlk. (*boucheanus*, Ratz.), *Hemiteles tenellus*, Say, and *Dimmockia incongrua*, Ashm. Examination of extensive collections of *A. melanoscelus* indicated that from 25 to 30 per cent. of the cocoons of the first generation produce adults, while less than 1 per cent. of the second generation, which spin their cocoons in July and carry the species over the winter, produce adults in the following spring. Quite 50 per cent. of these cocoons give no adult of either

parasite or host, as a result of the extensive feeding of the adult hyperparasites and the competition between several species of hyperparasites for the same individual host. In the case of most of the secondary parasites observed, there were several larval instars, but the feeding period was always short. All the hyperparasites obtained from *A. melanoscelus*, except for two species of *Pleurotropis*, proved to be essentially secondary, though nearly all may sometimes be accidentally tertiary. *Pleurotropis tarsalis*, Ashm., and *P. nawai*, however, were tertiary in nearly all cases and sometimes appear to exert a considerable check on the increase of certain secondary parasites.

SWENK (M. H.). **Further Experiments with Poisoned Baits for Grasshoppers.**—*Nebraska Agric. Expt. Sta., Res. Bull.* 41, 44 pp., 12 refs. Lincoln, Neb., May 1927.

These experiments carried out in 1923, like those of 1922 [*R.A.E.*, A, xi, 134], were based almost entirely upon the reactions of *Melanoplus bivittatus*, Scud., to poisoned baits. Amyl acetate (technical no. 1 grade, previously referred to as banana oil) is more attractive to immature than to adult grasshoppers, the most generally attractive strength being  $\frac{3}{4}$  oz. to 25 lb. bran. On the basis of both attractiveness and killing efficiency  $1\frac{1}{2}$  lb. white arsenic to 25 lb. bran is considered to be the most satisfactory proportion, as although good control was generally obtained with baits containing as little  $\frac{1}{4}$ – $\frac{1}{2}$  lb., those containing  $1\frac{1}{2}$ –2 lb. were the most attractive and gave more consistent results. For baits made with sodium arsenite solution containing 8 lb. arsenious oxide to 1 U.S. gal., a strength of  $\frac{1}{4}$  U.S. pint to 25 lb. bran is considered the most satisfactory, as the slightly greater attractiveness of baits containing  $\frac{3}{4}$  or 1 U.S. pint and the slightly greater killing efficiency of that containing  $1\frac{1}{4}$  U.S. pints were not sufficient to justify their greater cost.

Molasses should be omitted from baits containing white arsenic or other dry poisons, as the experiments showed that such baits were, on an average, 22 per cent. more effective without its addition, but should be included at the rate of 2 U.S. qts. to 25 lb. bran in baits poisoned with sodium arsenite solution, as this increased the attractiveness of these baits by an average of 32 per cent. The addition of 1 lb. calcium chloride to 25 lb. bran keeps the bran moister and more attractive in hot, dry weather, but the high cost renders its use impractical. Freshly prepared baits are 21 per cent. more attractive to grasshoppers than the same baits when they have become stale and fermented.

Baits are most effectual if application is begun at about 7 a.m., if most of the grasshoppers are immature, or at about 9 a.m. if they are chiefly adult, but they should be applied about an hour later, or nearer the time of maximum feeding, where the acreage is small. Where grasshoppers are abundant, the bait should be scattered at rates of not less than 20 lb. to the acre, wet weight. Adult grasshoppers are more likely to survive the ingestion of poison baits than immature ones. A large kill can be secured by treating heavily with bait strips of lucerne left standing round a newly-cut field. Experimental spraying of a lucerne field with Paris green and water and other arsenicals showed that this method is not more effective than the use of poisoned baits in controlling grasshoppers.

The baits recommended for immature grasshoppers are 25 lb. coarse-flaked wheat bran,  $2\frac{1}{2}$  U.S. gals. water and  $\frac{3}{4}$  oz. amyl acetate, with the

addition of either  $1\frac{1}{2}$  lb. white arsenic or  $\frac{1}{4}$  U.S. pt. sodium arsenite solution and 2 U.S. qts. sugar-beet molasses; for adults 1 lb. salt should be added to either mixture. The cost is less than 1s. 6d. an acre. A series of comparisons with the formulae in use in other Western States shows that the baits here discussed resemble them very closely.

BRUES (C. T.). **Observations on Wood-boring Insects, their Parasites and other associated Insects.**—*Psyche*, xxxiv, no. 2, pp. 73-90, 1 ref. Boston, Mass., April 1927.

The author gives a long annotated list of insects that emerged from stored wood in Massachusetts from early July to late September and discusses the phylogeny of the principal groups represented; he considers that these groups constitute a primitive fauna that has long been characteristic of wood, mainly of dead or dying trees.

FOLSOM (D.). **Virus Diseases of the Potato.**—*18th Ann. Rept. Quebec Soc. Prot. Plants, 1925-26*, pp. 14-29, 9 pls., 19 refs. Quebec, 1926. [Recd. June 1927.]

In the course of this paper on investigations on the virus diseases of potatoes in Maine, the author tabulates the differential characteristics of five types of mosaic disease and six other types. Transmission experiments with Aphids gave positive results with four of each group of diseases.

CHITTENDEN (F. H.). U.S. Bur. Ent. **The Florida Potato Plant-bug.**—*Qtrly. Bull. State Plant Bd. Florida*, xi, no. 3, pp. 115-118. Gainesville, Fla., April 1927.

The Coreid, *Corecoris diffusus*, Say, all stages of which are described, attacks potato and a wild *Solanum* (apparently *S. nigrum*) in Florida, and has also been recorded on *Canna*, wild mustard, tomato, cucumber, and the leaves of grape. Eggs were observed in clusters on the lower surface of the leaves and hatched in February and late in August.

MOZNETTE (G. F.). U.S. Bur. Ent. **Notes on some Insects occurring on the Island of New Providence, Bahama Archipelago, and their Bearing on Horticulture in Florida.**—*Qtrly. Bull. State Plant Bd. Florida*, xi, no. 3, pp. 119-121. Gainesville, Fla., April 1927.

In 1923 an investigation was made of *Toxotrypana curvicauda*, Gerst. (papaya fruit-fly) on the Island of New Providence (Bahama Archipelago), with a view to finding natural enemies. This insect is as injurious to the papaya (*Carica papaya*) there as in southern Florida. No parasites or predators were found.

Avocados [*Persea gratissima*] are also largely grown in the native settlements on the island and were found to be infested with *Trialeurodes floricola*, Quaint., *Empoasca minuenda*, Ball, *Frankliniella cephalica*, Crwf., *Pseudococcus nipae*, Mask., *Chrysomphalus dictyospermi*, Morg. (also on bread fruit [*Artocarpus incisa*]), *Aleurocanthus woglumi*, Ashby, *Gracilaria perseae*, Busck, and *Heliothrips haemorrhoidalis*, Bch. A few predators, such as *Scymnus utilis*, Horn, were observed, but were all species already present in Florida. On mangos were found *Vinsonia*

*stellifera*, Westw. (also on sapodilla [*Achras sapota*]), *Coccus acuminatus*, Sign. (also on breadfruit), *Heliothrips rubrocinctus*, Giard, and *Aleur-ocanthus woglumi*, Ashby. *Anastrepha fraterculus*, Wied. (West Indian fruit-fly) apparently did not occur. By far the most important pest in the Island is *A. woglumi*, which has practically ruined the citrus industry, and also attacks mango, sapodilla, avocado, *Anona*, banana and *Cryptostegia grandiflora*. It is gradually spreading to other Islands, and nothing has as yet been done to check it. *C. grandiflora* is at present being tested in Florida as a possible source of rubber production, as it produces a high grade of rubber and appears to grow well in southern Florida.

CHAPMAN (R. N.). **Animal Ecology with especial Reference to Insects.**—4to, mimeographed, ix, 187 & 183 folios, numerous tables and refs. Minneapolis, Minn., Burgess-Roseberry Co., 2nd edn., 1927. Price, \$4.85.

The author lays special stress on quantitative data. Under physical autecology the effects of light, temperature, moisture, pressure, movements of the media, gases and the concentration of ions are discussed, and methods of measuring the intensity of the various stimuli are described. In this section, also, nutrition as an ecological factor is dealt with, though it is recognised that in this physical and biotic influences are combined.

In succeeding pages, on biotic autecology, the principle of "biotic potential" is enunciated, and an effort is made to evaluate quantitatively the factors in the struggle for existence. Biotic potential is defined as "the inherent power of an organism to reproduce and survive, that is, to increase in numbers." It is a "quantitative expression of the dynamic power of the species, which is pitted against the resistance of the environment in the struggle for existence." Various "constants"—"reproductive," "survival," "nutritive" and "protective"—of biotic potential are characterised. These concepts are exemplified by a modification of such formulae as that of Thompson [*R.A.E.*, A, xiv, 568, etc.] for calculating the number of generations required for a parasite to overtake a host.

Synecology includes a distributional aspect, under which distribution and ecological succession in plants and animals are considered; and a descriptive aspect, where on the one hand aquatic and on the other terrestrial communities are described. By far the greater space is given to aquatic communities, because their characters are much the more amenable to quantitative investigation.

An extensive bibliography is supplied at the end of nearly every section and subsection. The work is illustrated by numerous tables and graphs and some figures of apparatus.

ESDAILE (P. C.). **Economic Biology for Students of Social Science.** **Part I. Harmful and Useful Animals.**—8vo, xv + 175 pp., 150 figs. London, Univ. London Press Ltd., 1927. Price 7s. 6d. net.

The author disclaims the description "text-book" for this popular work, which presents a study in biology as applied to household and social science and is designed particularly for the use of teachers of household science or those engaged in sanitary or hygienic work. It comprises a compilation of facts concerning insects and other animal

organisms closely associated with man and the household, as well as insects that produce articles of commerce. Many of the figures are original camera lucida drawings made from rearings in the laboratory. The volume is supplied with a glossary of scientific terms and an index.

BALLARD (E.). **The Entomological Problems of Queensland Cotton Growing.**—*Empire Cotton Growing Rev.*, iv, no. 3, pp. 196–205, 1 map. London, July 1927.

The Queensland cotton boom began some five years ago and reached its apex in 1923–24. The cotton areas consist of a series of groups of farms often separated from each other by many miles of forest land or bush, and there are abundant Malvaceous plants on which cotton pests can breed. All the pests present occur fairly uniformly throughout the cotton belt, with the exception of the pink bollworm and a Jassid, the former of which is only a pest north of the 26th parallel, while the latter is confined to crops growing in certain soils.

The problem of dealing with *Heliothis obsoleta*, F. (corn ear worm) has been solved by studying its reactions to temperature [*R.A.E.*, A, xiv, 589]. In Queensland the real damage is done to the plant while the squares are setting. During late winter and early spring the increase of the pest is slow, its life-cycle becoming shorter as the temperature rises with the onset of summer, and the maximum population being reached in late December, January and February. If cotton is planted in September or early October, the squares set before *H. obsoleta* attains maximum numbers and a crop is obtained in spite of as many as 50 or 60 per cent. of the squares being removed. In normal seasons, early planting alone will save a crop from *H. obsoleta* without recourse to insecticides, and when this is not possible, maize can be used as a trap-crop with good results. Maize is nearly always grown by Queensland farmers, generally in two sowings, in August and December, and even this routine crop is advantageous as it attracts *H. obsoleta* from cotton at a very early stage. The value of calcium arsenate dust has not yet been proved; its disadvantage lies in the high cost of insecticides and dusting machinery in Australia.

Two pests of equal importance, although less noticeable, that attack the bolls and seeds are *Tectocoris lineola*, F. (harlequin bug) and *Dysdercus sidae*, Montr. Both of these find favourable conditions in the high temperatures and humidity on the coast, while further inland, where frosts occur early and are often severe and where there is often high temperature and low humidity, conditions are less suitable for them. A study of weather conditions has shown that they undoubtedly are influential in determining whether *Dysdercus* will be abundant in any particular season or not. It has been found that the pods and seeds of *Sterculia* spp. have a food value for *Dysdercus* equal to cotton bolls and seeds, while *Sida* and *Malvastrum* spp., on which it is often found during the winter, only enable it to produce small broods. The adults live long in winter and a much shorter time in summer, being unable to stand temperatures of about 100° F. or more. The author considers that their migration has nothing to do with the opening of cotton bolls, but that once the adults are in the field an open or opening boll is chosen before anything else. The exhaustion of the natural food-supply may cause migration, but it is more probably due to combined effects of temperature and humidity. All attempts at control measures for *Dysdercus* have failed; the insect seems to be most

abundant when crops are in their healthiest condition, and scarcest when the plants are suffering from drought or flood. Some economical and simple remedy is urgently required, for early planting, although it affords a certain amount of protection to the crop, is not sufficient in itself as it is against *H. obsoleta*. *T. lincola* is easily dealt with by hand-picking, as eggs, nymphs and adults are all conspicuous and easily collected.

The pink bollworm *Platyedra scutigera*, Holdaway, with regard to which the author considers the evidence of its being distinct from *P. gossypiella*, Saund., to be powerful but not conclusive [*R.A.E.*, A, xiv, 459], sometimes causes severe local infestations. It originally established itself on *Hibiscus tiliaceus*, attacking cultivated cotton grown in the vicinity, and when it was discovered, arrangements were made for the disinfection of all seed used for sowing, but it proved impossible to enforce legislation regulating the growing of cotton. Several minor pests also occur [*R.A.E.*, A, xiv, 590]. Cutworms can be controlled by the usual Paris green and bran bait, but as the moths never oviposited on cotton unless their favourite weed was present, clean cultivation would be of the greatest assistance in eliminating them. The Coreid bug, *Aulocosternum nigrorubrum*, Dall. (false stainer), may be the cause of shedding of as many as 70 per cent. of the squares. Several small Capsid bugs also do minor damage.

**Additional Diseases under the Orchard and Garden Diseases Act, 1908.**—*N.Z. Gaz.*, no. 45. Wellington, 4th July 1927.

The potato moth, *Phthorimaea operculella* (*Lita solanella*), mosaic diseases and certain fungi are hereby brought within the scope of the above Act.

BRITTAI (W. H.). **Experiments in the Control of Scavenger Termites in India and Ceylon by means of Calcium Cyanide.**—*Res. Devpmt. Cyanogas Calcium Cyanide*, Sect. 4, pp. 115-124, 2 figs. New York, N.Y., The American Cyanamid Co., 1927.

These experiments with calcium cyanide for the destruction of termites at Dacca and in Ceylon have already been noticed [*R.A.E.*, A, xiv, 368, 555].

WAHL (R. O.) & POWELL (A. R.). **The Importance of Nest Structure in the Control of certain South African Termites with Cyanogas Calcium Cyanide.**—*Res. Devpmt. Cyanogas Calcium Cyanide*, Sect. 4, pp. 125-140, 13 figs., 7 refs. New York, N.Y., The American Cyanamid Co., 1927.

The work of various authors on the control of termites by means of calcium cyanide is briefly reviewed. It has not always proved successful, but the authors consider that in cases of failure a complete distribution of the dust within the nest had not been obtained, the application having probably been made into galleries that led away from the nest into air pockets or blocked chambers. A study of the structure of the nests of *Eutermes trinervius*, Ramb., *Macrotermes natalensis*, Hav., *M. bellicosus*, Smeathm., *Termes* (*Odontotermes*) *badius*, Hav., *T. (O.) transvaalensis*, Sjöst., *T. latericius*, Hav., and

*Hodotermes* sp., was therefore undertaken, and the proper application of cyanogas calcium cyanide to these various types of nests is described.

CHEN (S. C.). **Growth in Body Length, Body Width, Distance between Eyes, and Distance between Cornicles of *Aphis pseudobrassicae*.**—*China Jl.*, vii, no. 2, pp. 91–96, 2 figs., 1 ref. Shanghai, August 1927.

The contents of this paper, which includes the results of investigations undertaken for the purpose of obtaining data on growth in Aphids, are indicated by its title.

**Reports on the Operations for the Control of *Phytalus smithi* during the Seasons 1923-24, 1924-25, and 1925-26.**—Fol., 4 pp. each. Mauritius, 11th September 1924, 30th July 1925, 7th September 1926. [Recd. July 1927.]

The first and last of these reports were written by D. d'Emmerez de Charmoy and the second by W. H. Edwards. The campaign against *Lachnosterna* (*Phytalus*) *smithi*, Arrow, has been carried out on the same lines as in previous years [*R.A.E.*, A, ix, 145], the numbers of beetles captured having increased from 52 millions in 1923–24 to 68 millions in 1925–26. Paradichlorobenzene, calcium cyanide and petrol were employed in a new series of experiments in soil treatment for the control of this beetle with practically negative results.

The Scoliid parasite, *Tiphia parallela*, Smith, while abundant in some districts, has failed to establish itself in the new areas into which it has recently been introduced.

**Ginger: its Cultivation, Preparation and Trade.**—*Bull. Imp. Inst.*, xxiv, no. 4, pp. 667–682, 1 photo. London, February 1927.

The insect pests of ginger are very few. In Bengal a *Drosophilid* larva, which usually occurs on coarse grasses, has been observed to do a considerable amount of harm to the shoots. In southern India the Hesperiid, *Udaspes folus*, Cram., sometimes does serious damage to the leaves; *Dichocrocis punctiferalis*, Gn., bores into the stem and rhizome, but does little harm; and the rhizome is also bored by the larva of a Micropezid, *Calobata* sp. The flies lay their eggs at the base of the plants, and when the crop is harvested, the larvae migrate to wild arrowroot, on which they complete their development. The best control is said to be the destruction of the wild food-plant.

*Aspidiotus destructor*, Sign., has been found on ginger in Fiji, but the extent of the damage it does is not known.

OTANES (F. Q.). **Insects: their Relation to Man and their Control.**—*Philippine Agric. Rev.*, xviii, no. 4, pp. 373–410, 9 pls., 2 refs. Manila, 1925. [Recd. June 1927.]

In this general paper on insects and the control of pests, a considerable amount of the information has been taken from the work of other authors, but is correlated with experience in the Philippines. Estimates are given of the enormous losses caused by insects and the amount spent annually on their control, particularly in the United

States. The various means of control discussed include the use of insecticides, which are dealt with in some detail; mechanical methods such as hand picking, drowning, trapping, etc.; cultural practices; the introduction and protection of natural enemies, particularly insects; and plant quarantine and inspection. Instructions for the despatch of insects for identification and a questionnaire to be filled in by the sender are appended.

MERINO (G.), TEODORO (N. G.) & OTANES (F. Q.). **The Philippine Plant Quarantine Service.**—*Philippine Agric. Rev.*, xviii, no. 4, pp. 411–461, 5 pls. Manila, 1925. [Recd. June 1927.]

The laws and regulations in force in the Philippines governing the import and export of plants are given in full [*cf.* *R.A.E.*, A, xiv, 94]. The necessity for plant inspection and quarantine work is discussed, and notes are given on a few of the more serious pests and diseases, the introduction of which it is important to prevent. Information on quarantine procedure and facsimiles of the various forms to be used are given for the instruction of importers and exporters of plant materials. A list of countries that have provided for the inspection and certification of plant materials is also given.

TEODORO (N. G.). **The Plant Pest and Disease Control Service of the Philippine Bureau of Agriculture.**—*Philippine Agric. Rev.*, xviii, no. 4, pp. 463–549. Manila, 1925. [Recd. June 1927.]

An account is given of the work of the Plant Pest and Disease Control Service of the Philippine Bureau of Agriculture, which includes plant inspection and quarantine service, entomological research and pest control. Laws providing for the organisation of campaigns against locusts and details of the methods of carrying out the work of extermination are given. Notes on various other pests are included.

OTANES (F. Q.). **Rice Cutworms** (*Spodoptera mauritia*, **Boisd.**, *Prodenia litura*, **F.**).—*Philippine Agric. Rev.*, xviii, no. 4, pp. 551–554, 2 pls. Manila, 1925. [Recd. June 1927.]

At times, the two cutworms, *Spodoptera mauritia*, **Boisd.**, and *Prodenia litura*, **F.**, appear in such numbers as to cause considerable damage to rice plants, especially seedlings. In the Philippines they are most numerous during May, June and July, the months when upland and seed-bed rice is planted. All stages of the insects are very briefly described. The numbers of days required for the egg, larval and pupal stages are 2–4, 20–46 and 8–11 for *P. litura*, and 2–4, 14–23 and 7–16 for *S. mauritia*. The usual control measures are recommended [*R.A.E.*, A, vii, 405; x, 74] and include the use of baits and arsenical sprays. The eggs and larvae are attacked by numerous insect enemies, including Tachinid flies, which are parasitic on the latter. The protection of certain birds, such as the martins [*Aethiopsar cristatellus*] is recommended, and poultry should be allowed access to fields and beds where possible.

OTANES (F. Q.). **"The Toy Beetle"** (*Leucopholis irrorata*, Chev.) in the Philippines, a serious Pest.—*Philippine Agric. Rev.*, xviii, no. 4, pp. 555-557, 1 pl. Manila, 1925. [Recd. June 1927.]

The information here given on the bionomics and control of *Leucopholis irrorata*, Chev., attacking a variety of plants in the Philippines, differs slightly from that already noticed [*R.A.E.*, A, xiv, 94]. The adults emerge during May and June after the first heavy rains and oviposit in the soil during May, June, July and possibly August. The eggs hatch in about 16 days, and the larvae pupate in March and April. Pigs eat the larvae and should be allowed to root in fallow fields, while these animals as well as poultry and dogs should be encouraged to follow the plough.

SISON (P.). **The Cabbage Caterpillar** (*Crocidolomia binotalis*, Zell.). — *Philippine Agric. Rev.*, xviii, no. 4, pp. 575-577, 1 pl. Manila, 1925. [Recd. June 1927.]

The larvae of the Pyralid, *Crocidolomia binotalis*, Zell., are very injurious to cabbage, mustard and related plants, feeding on the succulent young leaves and buds and stunting the plants or devouring them entirely. They also bore into the heads of cabbage and feed inside until they are ready to pupate. The eggs are laid on the lower surface of the leaves in clusters of 20-100 and hatch in 3-5 days. After approximately 11 days, the mature larvae pupate in the soil, and the adults emerge 6-8 days later. As it takes from 95-140 days to grow a crop of cabbages, it is possible that there may be 3-4 generations during that period. All stages of the moth are briefly described. The newly hatched larvae should be crushed on the leaves while still feeding in groups, or dropped into a tin can containing soap solution or water to which kerosene or crude oil has been added. Bamboo forceps are recommended for picking off the caterpillars, since they do not injure the foliage. Spraying with a solution of yellow Chinese soap [*R.A.E.*, A, xii, 525] is effective. It should be applied to the lower surface of the leaves as often as necessary, preferably in the early morning or late afternoon when the caterpillars feed. Hard white soaps are not recommended since they are too caustic and may scorch the leaves. Lead or calcium arsenate sprays should be used at the rate of 3-7 lb. to 100 gals. water, and will adhere better if resin soap is added. The spraying should be done in the afternoon in order to poison the caterpillars feeding the following night.

TAN (J. P.). **The Citrus Bark Borer** (*Agrilus occipitalis*, Eschsch.).— *Philippine Agric. Rev.*, xviii, no. 4, pp. 583-584, 1 pl. Manila, 1925. [Recd. June 1927.]

The larvae of the Buprestid, *Agrilus occipitalis*, Esch. (citrus bark-borer) are the worst pests of orange and lemon trees in the Philippines. The eggs, which are laid preferably in wounds and cracks in the stems and branches, hatch in 9-12 days, and the larvae bore into the stem and mine under the bark for 45-60 days; pupation then takes place within the stem, and the adults emerge 10-13 days later. All stages of the insect are briefly described. Young trees that are badly attacked usually die, and larvae may be found in the large roots when most of the bark on the trunk and branches has been destroyed. The adults feed along the margin of the leaves, making characteristic cuts. When

the tree is approached, they may hide on the lower surface of the leaves, and if jarred they at once drop and fly. Since the larvae work under the bark, it is difficult to poison them without doing harm to the tree; control measures are therefore directed against the adults. They may be collected by hand, or sprays of lead or calcium arsenate at the rate of 5-15 lb. to 100 gals. may be used. If yellow Chinese soap solution [R.A.E., A, xii, 525] is added, the sprays will adhere better, and Aphids, scale-insects, mites and any beetles that are wetted by them will also be killed. The painting of trunks and branches with various forms of concentrated lime-sulphur is recommended as a deterrent to oviposition, while cutting off infested branches will also reduce the severity of the attack.

TEODORO (N. G.) & OTANES (F. O.). **Philippine Literature Index of Plant Pests and Diseases, I.**—*Philippine Agric. Rev.*, xviii, no. 4, pp. 593-602. Manila, 1925. [Recd. June 1927.]

This list, which is the first of a series, gives references to papers, brief articles and notes on plant pests and diseases published in the *Philippine Agricultural Review* prior to January 1924. Lists of plant quarantine orders and circulars of the Philippine Bureau of Agriculture dealing with plant pests and diseases are appended.

TEODORO (N. G.) & SERRANO (F. B.). **Abaca Heart-rot and Bunchy-top Diseases and their Control.**—*Philippine Agric. Rev.*, xix, no. 3, pp. 243-247, 20 pls., 1 ref. Manila, 1926. [Recd. June 1927.]

Bunchy-top or root-rot disease of Manila hemp [*Musa textilis*] is believed to be caused, at least in part, by the Nematode, *Heterodera radiculicola*, Greeff [R.A.E., A, xv, 346]. The symptoms of the disease and the injury caused by the Nematode to the roots are described. All plants in badly infected fields should be dug up, chopped into small pieces and burnt. In lightly infected fields, diseased plants and all others within a radius of eleven yards should be destroyed. Where burning is impracticable, the chopped plants should be mixed with lime, though this procedure is less certain in its action. The holes should subsequently be limed, the treated area securely fenced off and no crops grown for at least three years. To avoid spreading the Nematode, the clothes of workers in infested areas should be scraped clean, their hands, feet and shoes should be disinfected (mercury bichloride, 1 : 1,000 is recommended), and their tools wiped and passed through a flame or disinfectant. If infested land cannot be kept free of all vegetation for two to three years in order to starve out the Nematodes, it may be planted with non-susceptible plants, such as rice, maize, peanuts [*Arachis*], sweet potatoes, etc. Heavy applications of fertilisers are said to be effective in reducing Nematode injury, those containing potash being especially recommended, except in soils where this substance is already present in abundance. Other measures recommended include ploughing the soil and allowing it to dry for several months where rain is not likely to interfere; preventing the washing of soil by rain from infected to uninfected fields by means of embankments, ditches, etc.; quarantines; and attempts to develop resistant varieties of Manila hemp.

TEODORO (N. G.) & GOMEZ (E. T.). **Coffee Diseases and their Control.**  
—*Philippine Agric. Rev.*, xix, no. 3, pp. 249–257. Manila, 1926.  
[Recd. June 1927.]

Root mealybug disease of coffee is probably due to the associated attack of *Pseudococcus citri*, Risso, and the fungus, *Polyporus coffeae*. It is not known which of these two is primarily responsible, but it seems likely that neither can cause the symptoms in the absence of the other. The cottony mycelium of the fungus serves as a secure enclosure for the eggs of the mealybug, and it is not unlikely that the fungus is semi-parasitic and destroys the coffee roots after they have been attacked by the insect. To control the disease early treatment against the mealybug is advisable, since the presence of a coating makes this difficult. The coating can, however, be scraped off and the diseased parts sprayed with tobacco-soap solution or lime-sulphur mixture. The removal of all seriously infested roots is the most practical method of control.

GEORGE (L.). **Observations sur la biologie de deux Hyménoptères entomophages.**—*Bull. Soc. Hist. nat. Afr. N.*, xviii, no. 3, pp. 55–71. Algiers, 15th March 1927. [Recd. July 1927.]

The observations here described were made in Algeria. *Apanteles glomeratus*, L., was found (as in the case of previous observations) to attack the larvae only of *Pieris brassicae*, L., and especially the young ones up to 48 hours after hatching; after that time the rate of parasitism gradually diminished, and larvae more than 5 days old were never attacked. Larvae of *P. brassicae* taken on wild crucifers (*Sinapis*) were found to be far less heavily parasitised than those on cultivated varieties, but experiment proved that this is due only to the scattered nature of the colonies on the wild plants. On cabbages grown in an enclosed garden the degree of parasitism is always higher than on cabbages in the open, largely because in the latter case the hibernation quarters frequently get disturbed and destroyed. On *Tropaeolum majus* (with one exception), *T. minus*, *Eruca sativa*, *Cochlearia armoracia* and *Capparis spinosa*, *P. brassicae* was found to be free from parasitism, the odour of these plants apparently being repellent to the Braconid. The period spent by *A. glomeratus* within its cocoon is generally from 10 to 14 days for the spring generation, and in autumn emergence generally occurs from 20 to 30 days after construction of the cocoon. Besides this normal emergence there are in almost every group of autumn cocoons certain individuals that hibernate as larvae and pupate in the spring (March and April) only 2 or 3 days before emergence. This diapause enables the species to survive in the temporary absence of hosts and during unfavourable climatic conditions. Observations on parthenogenesis and proportion of the sexes of *A. glomeratus* are recorded. Males were found to predominate almost invariably in the September and December generations, while in the March and July generations females were in the majority; this holds good whether the food-plant of the host is *Sinapis* or *Brassica*. Four generations were recorded, in December, March, July and September, the first two being much more important than the last two. Many individuals of *A. glomeratus* are themselves parasitised by *Hemiteles fulvipes*, Grav., and by *Tetrastichus rapo*, Wlk.

*Pteromalus puparum*, L., always infests the young pupae (not more than 7 days old) of *P. brassicae*, attacking them whatever the food-plant of the larvae may have been, and is a polyphagous species, having been reared by the author from *P. napi*, L., *P. rapae*, L., *Papilio machaon*, L., and *Pyrameis cardui*, L.

As in the case of *A. glomeratus*, there is retarded development in certain individuals of *P. puparum*; parthenogenesis occurs, and the proportion of males is much greater in the autumn than in the spring generation.

RAVAZ (L.). **La Maladie rouge (Tétranyque).**—*Prog. agric. & vitic.*, lxxxviii, no. 27, pp. 3–4, 1 pl. Montpellier, 3rd July 1927.

Vines on the roadside are attacked by the mite, *Tetranychus telarius*, L., the foliage becoming red or yellow, and finally falling. The damage is most marked where there is the greatest exposure to dust. The mite lives and feeds on the lower surfaces of the leaves, along the mid-ribs, and ordinary applications of sulphur such as are effective against many other mites do not affect it.

VERCIER (J.). **Un nouveau piège lumineux phosphorescent.**—*Prog. agric. & vitic.*, lxxxviii, no. 28, pp. 44–45. Montpellier, 10th July 1927.

The author describes a light trap in which the usual acetylene flame is replaced by a phosphorescent paste, which needs no renewing and gives off at night the light stored up during the day. If a sufficient quantity of these traps were employed, an effective number of moths might be caught, but the cost would probably be prohibitive, and it is suggested that they should merely be used to indicate the date of maximum flight of the moths.

COUDERC (L.). **Bivoltinisme artificiel des oeufs ou graines de vers à soie.**—*Prog. agric. & vitic.*, lxxxviii, no. 28, p. 47. Montpellier, 10th July 1927.

The author discusses an improved technique for use with the hydrochloric acid method of producing rapid hatching of the eggs of silk-worms [*Bombyx mori*, L.].

**Importation of Potatoes (Canary Islands) (Scotland) Order of 1927.**—*Statutory Rules & Orders*, 1927, no. 510/S. 28. London, 7th June 1927.

To prevent the introduction of *Phthorimaea operculella*, Zell., the landing in Scotland of any potatoes grown in the Canary Islands is prohibited, unless accompanied by a prescribed certificate.

KELER (S.). **Szkodniki roślin uprawnych w Wielkoposce, na pomozu i na sasku w r. 1924 i 1925.** [Noxious and beneficial Animals of cultivated Plants in West Poland during 1924 and 1925.]—*Prace Wydziału Chorób Roślin Państw. Inst. Nauk.-Rolnicz. Bydgoszcz*, no. 2, 48 pp., 1 pl., 3 refs. Bydgoszcz, 1927. (With a Summary in English.)

A general account is given of observations, both under natural and artificial conditions, on a number of pests occurring in Poland,

most of which are insects. A considerable amount of new data on their bionomics has been accumulated and will be published later.

KÉLER (S.). **Rejestracja szkodników w leśnictwie i jej znaczenie dla biologa i praktyka.** [Records of Forest Pests and their Importance in Biology and Practical Work.]—*Prace Wydziału Chorób Roślin Państw. Inst. Nauk.-Rolnicz. Bydgoszczy*, no. 3, reprint, 17 pp., 1 pl., 1 graph. Bydgoszcz, 1927. (With a Summary in English.)

As the result of a study of records of the occurrence of *Hyloicus pinastri*, L., *Dendrolimus pini*, L., *Bupalus piniarius*, L., *Panolis flammea*, Schiff., and *Diprion (Lophyrus)* in a forest area in Poland during 1887–1920, an attempt is made to obtain data from which curves may be constructed that will indicate the economic importance of a given pest. It appears that serious outbreaks, especially of *Dendrolimus pini*, occur on the average about every 6 years. The factors used in such estimates are the mean frequency of the species, which is the arithmetical mean of all annual data; the normal stock, *i.e.*, the arithmetical mean of the years between outbreaks; the mean frequency during infestation, which shows the average degree of damage done; the minimum, which is the lowest annual mean; and the coefficient of damage, obtained by the multiplication of the average weight of needles eaten by one larva during the year by the mean frequency during infestation (when there is more than one generation a year the food of as many larvae as there are generations should be weighed).

The difference between the mean frequency and normal stock is the index of economic importance.

RUSZKOWSKI (J. W.). **Z obserwacji nad Niezmiarką paskowaną (*Chlorops taeniopus*, Meig.) oraz jej pasorzytami.** [Observations on the Gout-fly and its Parasites.]—*Rocz. Nauk. rol. leś.*, xvii, reprint, 22 pp., 4 figs., 14 refs. Posen, 1927. (With a Summary in English.)

*Chlorops taeniopus*, Mg., is a serious pest of cereals in Poland. The observations described were carried out in Posen during 1924–26. The reactions of various species and varieties of wheat to its attack are discussed. The time of sowing is an important factor influencing the amount of damage to the crop [*cf.* R.A.E., A, xiv, 603]; winter wheat was mostly free from attack, though in some cases the damage amounted to 7 per cent., while in spring wheat the damage varied from 9 to 38 per cent.

Parasites were very numerous, the most important being the Braconid, *Coelinius niger*, Nees. Though it was not found in 1923, it has since gradually increased in activity, the parasitism amounting to 61 per cent. in 1926, and its maximum occurrence is expected in 1927. The eggs of the parasite are laid in those of the host, and the adults emerge from the host larvae in the pupal cases.

*Microbracon (Bracon) longicollis*, Wesm., and *Dacnusa* sp., attack the larvae of *C. taeniopus*. *Stenomalus micans*, Ol., is apparently a hyperparasite, as it was obtained from cocoons of *Microbracon* sp.

SITOWSKI (L.). **Roztocze jako szkodniki traw zbożowych.** [Mites as Pests of Cereals.]—*Rocz. Nauk rol. iś.*, xvii, reprint, 3 pp. Posen, 1927. (With a Summary in German.)

*Pediculopsis graminum*, Reut., has been observed on rye in two localities in Poland, destroying about 50 per cent. of the crop. Female mites were found inside the stem.

WERTH (E.) & OTHERS. **Krankheiten und Beschädigungen der Kulturpflanzen im Jahre 1925.** [Diseases and Injuries of cultivated Plants in 1925 in Germany.]—*Mitt. biol. Reichsanst. Land- u. Forst.*, no. 32, 158 pp., 15 maps, 3 figs. Berlin, July 1927.

Extensive annotated lists of the insect pests recorded in Germany in 1925 are given, arranged according to crops.

JANCKE (O.). **Ein Parasit der Kirschblütenmotte** (*Argyresthia ephippiella*, F.). [A Parasite of the Cherry Blossom Moth, *A. ephippiella*.]—*Nachrichtenbl. deutschen Pflanzenschutzdienst*, vii, no. 8, pp. 73–75, 1 fig., 3 refs. Berlin, August 1927.

Cherries in the district of Naumburg were very seriously attacked by *Argyresthia ephippiella*, F., in 1926. In some orchards 75 per cent. of the blossoms were infested and the crop was a total failure. As the larvae live hidden within the blossoms, artificial measures must be directed against the eggs in the bark or against the young caterpillars just boring into the buds. A parasite obtained from *A. ephippiella* has been identified as an Encyrtid of the genus *Ageniaspis*, probably *A. atricollis*, Dalm., of which *Hyponomeuta padellus*, L., has been recorded as a host in Sweden. The biology of this parasite is to be studied. It apparently oviposits in the egg. There seems to be a polyembryonal development of the larvae within the host caterpillar; they do not emerge until the latter has crawled to the ground and spun its cocoon. A description of the adult parasite is given.

WERTH (E.) & WILHELM (P.). **Zur Kenntnis der Pflaumensägwespe** (*Hoplocampa fulvicornis*, Klug). [A Contribution to the Knowledge of the Plum Sawfly, *H. fulvicornis*.]—*Nachrichtenbl. deutschen Pflanzenschutzdienst*, vii, no. 8, pp. 75–76. Berlin, August 1927.

A series of observations with various plum trees in Berlin show that infestation by *Hoplocampa fulvicornis*, Klug, increases with the size of the fruits (up to a certain size) while the normal fall of the fruits decreases at the same time, the maximum infestation occurring after the fall has almost ceased. As the percentage of infestation in fruits on the tree is generally larger than that in fallen fruits and as the larvae on the tree are larger, it must be concluded that a migration from one fruit to another occurs before the former falls. The larvae probably become mature on the tree and drop to the ground on a thread. In 82 per cent. of the injured fruits there was only one bore-hole, which must therefore serve as both entrance and exit. In 16 per cent. of the injured fruits there are two holes and in about 1.5 per cent. of all the injured fruits, one of these occurs at the point

where the stem is attacked ; it is clear that there is no question of an attempt to cause the fruit to fall and thus convey the larva to the ground.

Observers differ as to whether the eggs of *H. fulvicornis* are laid at blossoming time externally on one of the calyx tips or placed within the plant tissue by the ovipositor. If the latter be correct, the present method of spraying is useless.

GASOW (H.). **Ei und Eiablage der Azaleenmotte** (*Gracilaria azaleella*, Brants). [The Egg and Oviposition of the Azalea Moth, *G. azaleella*.]—*Nachrichtenbl. deutschen Pflanzenschutzdienst*, vii, no. 8, pp. 76–77, 1 fig. Berlin, August 1927.

*Gracilaria azaleella*, Brants, lays its eggs singly, without any covering, on the lower surface of the leaves of azaleas near the mid-rib. On inspection of leaves the eggs may be distinguished from the leaf-surface as they reflect the light ; when detached from the leaf they appear white in colour. To facilitate the detection of the eggs several leaves may be picked and dropped into a dark-coloured basin of boiling water. In a few minutes the eggs assume a white colour and often come away or are readily detachable from the leaf, when they become easily visible against the dark surface.

**Krankheiten und Beschädigungen der Kulturpflanzen** [Diseases and Injuries of cultivated Plants] **im April, Mai, Juni 1927.**—*Nachrichtenbl. deutschen Pflanzenschutzdienst*, vii, nos. 6–8, pp. 56–57, 68–71, 80–82. Berlin, June–August 1927.

These monthly reports contain annotated lists of the insect pests recorded in Germany during the period under review, arranged according to the class of crop attacked.

ZACHER (F.). **Sommergefahren für die Fabrikation und den Handel von Süßwaren.** [Summer Dangers in the Manufacture of and Trade in Sweets.]—*Mitt. Ges. Vorratsschutz*, iii, no. 4, pp. 45–56, 2 figs. Berlin, August 1927.

Much of this information is substantially the same as that in a paper already noticed [*R.A.E.*, A, xiv, 437]. In the case of a severe infestation of cacao by *Ephestia elutella*, Hb., the larvae climb the walls of the store-room to pupate high up. The walls and ceiling may be washed with a solution prepared as follows : 3 lb. quassia chips are boiled in 2 gals. water, and after standing for 24 hours the decoction is poured off and mixed with a solution of 5 lb. soft-soap in 1 gal. water, and finally diluted to 20 gals. *Plodia interpunctella*, Hb., is a serious pest of marzipan. The rice-moth, *Corcyra cephalonica*, St., which is a serious pest of cacao and its products in the United States, is of rare occurrence in Germany.

DE JAEGER (A.). **Le présent et l'avenir de la culture houblonnière. La lutte technique, biologique et culturale contre les ennemis parasites du houblon.**—*Bull. Inst. sup. Fermentations de Gand*, 1927, reprint 20 pp., 13 figs., 1 ref. Ghent, 1927.

This is a popular account of the fungus diseases and insect pests of hops in Belgium. The latter include flea-beetles, *Tetranychus telarius*,

L., and *Phorodon humuli*, Schr. Various control measures are discussed, particular emphasis being given to the need of developing a Belgian variety of hop resistant to pests and diseases.

TOPI (M.). **Sulla esistenza di diverse razze della fillossera della vite e sui loro presunti caratteri distintivi.** [On the Existence of various Races of Vine Phylloxera and on their presumed differential Characters.]—*Monitore zool. ital.*, xxxviii, no. 7, pp. 167–180, 5 refs. Siena, 13th July 1927.

In continuing his studies on *Phylloxera* [*R.A.E.*, A, xiv, 518], the author found that the length of the rostral setae is fairly constant in the neogallicolae occurring on the hybrids commonly used as grafting stocks, but that it may show notable variations in those from other vines, such as the hybrids of *Vitis labrusca* (Clinton). The susceptibility to attack of the different vines can be influenced by the state of the plants (rapid growth, late season, etc.). It is, therefore, impossible to distinguish the two biological races by differences in the length of the rostral setae and in the susceptibility of the vines to attack. In the author's opinion his experiments and observations indicate that these differences are due to given strains of *Phylloxera* that prefer certain vines to others. It may be that this preference goes so far as to cause them to refuse other vines, but this has not been proved.

PRIESNER (H.). **Thysanoptera (Physopoda).**—*Die Tierwelt Mitteleuropas*, iv (Insekten, i), 2, viii, pp. 1–18. Leipzig [1927].

Keys to the Thysanoptera of Central Europe are given, with short biological notes.

COULON (L.). **Tenthredinides (mouches à scie) du Musée d'Elbeuf. (Collection européenne.)**—*Bull. Soc. Etude Sci. nat.*, xlv (1926), pp. 77–94. Elbeuf, 1927.

This is a list of the European sawflies in the museum of Elbeuf, with their food-plants.

**Proceedings of the South and East African combined Agricultural, Cotton, Entomological and Mycological Conference held at Nairobi, August 1926.**—8vo, vi+337 pp., 1 pl. Nairobi [?1927].

The following are among the conclusions and resolutions of the Entomological and Mycological Section of this Conference, at which the series of papers noticed below was read. A map of Africa should be prepared from information supplied by each territory concerned, showing the distribution of cotton cultivation and of the pink bollworm (*Platyedra gossypiella*, Saund.). No definite information can be supplied in regard to the natural occurrence of major pests and their occurrence under conditions of cultivation until a wider survey of the subject can be made. In view of the immense importance of cotton staining and internal boll rots to the future development of cotton growing in Africa, thorough investigations should be made into this problem, with special reference to the possible part played in the transmission by *Dysdercus* and other sucking insects. The Union of South Africa should be asked

to undertake the work. A meeting should be arranged between the Entomologists of Kenya and Uganda to discuss the prevention of the spread of *Stephanoderes hampei*, Ferr., into Kenya. In view of the entire dissimilarity of conditions and problems in South Africa to those in tropical East Africa the problem of the control of cutworms should be separately attacked in the various territories concerned.

Detailed lists of injurious insects and fungi, indicating their status and the plants attacked, should be prepared by each participating territory and interchanged. It is suggested that the Imperial Bureaux of Entomology and Mycology in London should be approached with a view to the compilation, classification and publication of such lists. Each Department of Agriculture in South and East Africa should notify without delay every other Department of the presence of a new disease or pest of economic importance. A study should be made of the insecticidal properties of native plants. Uniform legislation should apply to importation of plants and seeds into Kenya and Uganda.

Papers by H. C. Sampson, of the British Empire Cotton Growing Corporation, were read on the following subjects that relate to administrative measures for the control of insect pests: The control of the native cotton industry and how far the regulations in force for such control in the several countries represented are practical and adequate; the consideration of the question of the movements of cotton, seed cotton and seed from one territory to another; the control of ginneries with special reference to the spread of disease; and notification regarding the distribution, existence and occurrence of insect and fungoid pests.

As the codling moth [*Cydia pomonella*, L.] is at present unknown in Kenya, and in view of the fact that an apple industry is likely to be established in certain areas in the Colony, precautions necessary to prevent its introduction were discussed. The danger involved in the importation of apples into Kenya from South Africa was pointed out, but it was suggested that adequate inspection would be possible.

Mr. Van den Abeele suggested that the transport of seed from one Colony to another, or even from one part of a Colony to another part, should be so regulated as to make examination and perhaps disinfection obligatory under the control of a competent service of the country of origin, whose certificate, valid for three months, should be attached to the invoice. The general opinion was, however, that certificates were useless to prevent the introduction of pests.

HANCOCK (G. L. R.). [Note on Species of *Platyedra* occurring in Uganda.]—*Proc. S. & E. Afr. Agric. Conf.*, 1926, pp. 228–229, 1 ref. Nairobi [?1927].

A species of *Platyedra*, subsequently described by Meyrick [*Exotic Microlep.*, iii, p. 351, January 1927] as *P. erebodoxa*, has been found in Uganda feeding upon *Hibiscus diversifolius*. Apart from the fact that this species does not feed on cotton in the field, the chief point of difference between it and *P. gossypiella*, Saund. (pink bollworm), which it closely resembles, is the distinct break that occurs in the horseshoe arrangement of the crochets on the prolegs of the larvae instead of the complete horseshoe found in the latter. A young larva of *P. erebodoxa* was reared to maturity on a young cotton boll, but larvae could not be induced to feed on full-grown cotton bolls or on cotton seed. Although little danger to cotton is anticipated from this insect, studies are being

made of its natural enemies with a view to their possible use in other countries against *P. gossypiella*. Three Braconids have been bred from the capsules of *H. diversifolius*, and one of these, a species of *Microbracon*, has been observed to feed externally on larvae of *P. erebodoxa*.

**The Pink Bollworm** (*Platyedra gossypiella*).—*Proc. S. & E. Afr. Agric. Conf.*, 1926, pp. 174-177 & 229-233. Nairobi [?1927].

The following opinions were expressed by the Entomological Section in answers to questions on *P. gossypiella*, Saund. (pink bollworm). No effective control can at present be obtained by natural enemies, though in Egypt one of the parasites, *Pimpla roborator*, F., which becomes common at the end of the season, might be sufficiently increased early in the year to constitute a check upon its development. In countries where there is no definite winter and the bollworm breeds throughout the year in a succession of short-cycle generations, the destruction of alternative food-plants in conjunction with a close season for cotton is essential and should ensure a fair measure of control, the moths finding nowhere to lay their eggs and the larvae being unable to assume the long-cycle condition. Elimination of alternative food-plants would not, however, be economically worth while in countries with a definite winter where cotton is a summer crop and where *P. gossypiella* spends the winter as a resting larva in a double seed, as these larvae in the old bolls that fall to the ground and escape destruction ensure the survival of the species. Implemental cultivation and crop rotation are only applicable to countries where *P. gossypiella* undergoes a resting period, and mainly to places where cotton is grown by irrigation. Experiments carried out in Egypt [R.A.E., A, ix, 73; xiii, 422] have shown that berseem [*Trifolium alexandrinum*], which is frequently irrigated, is a more suitable crop to follow cotton than wheat, which receives much less water.

It is possible that if the moths drink dew they might be poisoned by calcium arsenate dusting. The use of light-traps against the adults will effect a slight reduction in infestation, but is not considered an economical measure. Hand-picking and the use of trap crops are also considered impracticable.

A. H. Ritchie stated that the Government of Tanganyika Territory is endeavouring to prevent the spread of *P. gossypiella* from the infested areas of the coast to the only two cotton areas near the Uganda border, which are uninfested. As there is a broad strip of barren country between these and the infested areas, the measures taken are likely to prove successful. Difficulty is experienced, however, in making the Arabs destroy the Peruvian cotton, which is sometimes infested and is grown along the old slave routes. He also said that in Tanganyika *P. gossypiella* attacking cotton pupates in the soil, there being no "twin-seeding," while the larvae attacking *Hibiscus esculentus* (okra), the only known alternative food-plant in the Territory, pupate in the pods and not in the soil, and that one of the most important parasites of the larvae attacks only those infesting *H. esculentus*. It was suggested that the form attacking this plant may be similar to that occurring in Uganda [see preceding paper], more especially as in Queensland species of *Platyedra* confined to *Hibiscus* are known [R.A.E., A, xiv, 459]. T. W. Kirkpatrick said that the known alternative food-plants of *P. gossypiella* in Egypt were *H. esculentus*, *H. cannabinus*, hollyhocks and possibly other Malvaceae.

*P. gossypiella* has not been reported from Kenya, Uganda, South Africa or the district of Lorenzo Marquez, although it occurs in the northern part of Portuguese East Africa.

C. B. Hardenberg stated that cottonseed, certified as having been subjected to the heat treatment before leaving Egypt, contained a number of live larvae and pupae of *P. gossypiella* on arrival in Portuguese East Africa by way of Liverpool. He found the treatment of cottonseed with sulphuric acid more satisfactory than that of fumigation, though even this acid was not always capable of penetrating the silky covering of "twin seeds."

HARGREAVES (H.). **A new and serious Boll Worm : *Argyroplote* sp.—**  
*Proc. S. & E. Afr. Agric. Conf., 1926, p. 171. Nairobi [? 1927].*

Larvae of *Argyroplote leucotreta*, Meyr., were found infesting unripe maize cobs in Uganda in 1921, and subsequently they have been found infesting cotton bolls, within which pupation takes place. Although extensive damage by this moth has not been observed on cotton in Uganda, the author considers it to be a potentially serious pest. Doubt was expressed as to the identity of this moth [but cf. *R.A.E.*, A, xiv, 324, 325].

SURCOUF (J. M. R.). **On *Apion armipes* and its Destruction by a natural Parasite.—***Proc. S. & E. Afr. Agric. Conf., 1926, pp. 171–172 & 233–234. Nairobi [? 1927].*

One of the pests noticed on cotton in 1925 in Zambesia (Portuguese East Africa) was *Apion armipes*, Wagn., which caused considerable damage. The adult weevils feed on the petals of the cotton flowers, and the females oviposit in the axils of the leaves, laying 3 or 4 eggs at a time. The larvae feed in the tissue of the young stems. A vigorous plant, when attacked near the growing point, develops secondary growth in the neighbourhood of the attacked region, but weaker plants die. Larvae of *A. armipes* were found to be parasitised by a small Hymenopteron, the larvae of which, when full-fed, leave the dead *Apion* larva and form on the outside of the stem elongated white silken cocoons, of which there may be at least a dozen from each host larva. About 250 parasites were released in one district with the result that *A. armipes* disappeared almost completely, and the author considers the breeding and liberation of parasites to be the best method of controlling this pest.

From the discussion that arose it appears that several species of *Apion* have been observed attacking cotton in various parts of East Africa, although none has so far been observed in South Africa. C. Smee stated that one species was reported as a serious pest in Nyasaland in 1909, but though still present there, does not do serious damage to cotton as it appears late in the season. C. B. Hardenberg said that *Apion* was a potential pest of very great importance in the district of Quilimane (Portuguese East Africa).

A. H. Ritchie stated that *A. xanthostylum*, Wagn., was found in one area only of Tanganyika, where the first generation attacks the base of young cotton, sometimes killing the plants, subsequent generations breeding at the junction of the branches and beneath the bolls and causing premature ripening and consequent weakening and shortening of the staple. In 1922 15 per cent. of the plants on the

experimental station in the infested area died from attack at the base, and it was realised that the weevil was a serious potential pest. Since that date it has been satisfactorily controlled by uprooting and burning all cotton plants at the end of each season.

**The Sudan Boll Worm** (*Diparopsis castanea*).—*Proc. S. & E. Afr. Agric. Conf.*, 1926, pp. 177-178 & 234-235. Nairobi [? 1927].

The Sudan bollworm, *Diparopsis castanea*, Hmps., which has not yet been reported from Uganda, Tanganyika or Kenya, is the most serious pest of cotton in Nyasaland and Portuguese East Africa, in parts of which it causes an 80 per cent. loss in the crop; it is also known to be present in the Belgian Congo and is a serious pest in South Africa, occurring in all the cotton areas except in certain parts of Cape Province. In South Africa it has been found on wild cotton (*Gossypium*) and in Zululand on another wild malvaceous plant; in Nyasaland it has been found once on *Thespesia*. The study of the wild food-plants is considered to be a matter of great importance calling for further investigation.

HAINES (G. C.). **Natural Enemies and Control of Bollworms in South Africa**.—*Proc. S. & E. Afr. Agric. Conf.*, 1926, pp. 235-237. Nairobi [? 1927].

Investigations are in progress on the parasites of the Sudan bollworm [*Diparopsis castanea*, Hmps.], the American bollworm [*Heliothis obsoleta*, F.] and the spiny bollworm (*Earias insulana*, Boisd.) in South Africa [*R.A.E.*, A, xv, 113-114]. Apart from records of high percentage of parasitism in the eggs of *H. obsoleta* late in the season and a few cases in which *E. insulana* was apparently controlled by two Hymenopterous larval parasites, instances of efficient natural control of bollworms have not been found to occur there. A Pentatomid, *Glypsus conspicuus*, Westw., has been observed attacking the larvae of *D. castanea* and *H. obsoleta*. Bollworm parasites have also been found to attack leaf-feeding larvae such as *Cosmophila aurigoides*, Gn.

Control by the elimination of food-plants has not been attempted; it would be impossible in the case of *H. obsoleta* on account of their great number, and difficult in the case of the *E. insulana* as malvaceous plants are numerous and widespread, while the food-plants of *D. castanea* are too little known; even if they were known, it is doubtful whether their elimination would have much effect until a means of controlling the pest on cotton is found. Cultural measures and crop rotation, in conjunction with a close season, offer a possibility of control that should be investigated. Spraying and dusting have been tested extensively, but have not given satisfactory results. Experiments in the trapping of adults are advocated, as it has been found that one female of *D. castanea* may lay nearly 500 eggs. The results obtained by hand-picking all squares and bolls and by picking all flared squares were negative. Experiments to determine the percentage of live larvae in flared squares showed that 31 per cent. of those that had been attacked by bollworms (both on the ground and on the plants) contained living larvae of *D. castanea*, 1-2 per cent. larvae of *E. insulana* and none larvae of *H. obsoleta*. During cold or wet weather a larger percentage of live larvae of *D. castanea* remained in the flared squares, and it was

observed that the larger larvae could live for a considerable time in the larger fallen bolls.

In the course of discussion A. H. Ritchie said that in Tanganyika there was only one generation of *H. obsoleta* on cotton each year, the larvae not being found in the bolls after June; C. Smee said that in Nyasaland this pest attacked tobacco first and cotton after the tobacco had been harvested.

[**Aphids and Jassids attacking Cotton.**]—*Proc. S. & E. Afr. Agric. Conf., 1926*, pp. 173-174 & 180-181. Nairobi [? 1927].

F. R. Parnell briefly described investigations on *Empoasca* (*Chlorita*) *facialis*, Jac., in South Africa and the selection of resistant strains of cotton [*R.A.E.*, A, xv, 195; etc.]. A note by G. C. Haines was read in which he stated that this Jassid was a serious pest only under certain conditions in the low veldt of South Africa and had never been very injurious at higher altitudes, although it occurs throughout the cotton areas. Bordeaux mixture, either as a dust or spray, was the only substance that had given at all lasting results against this pest, the effect of nicotine dust, which is toxic if applied at sufficient strength, being merely transient, and the results of calcium cyanide applications being unsatisfactory. There was no direct evidence to show that cultivation affects the outbreaks on cotton, except that they appear to be delayed in well-drained fields.

H. Hargreaves said that the accumulated effect of attacks of Aphids on cotton in Uganda appears to be greater than that of any other insect, but that the incidence varies according to the time of planting, and although older plants suffer, young plants sustain the most serious damage. C. B. Hardenberg said that in Portuguese East Africa, where Aphids are not considered a serious pest of cotton, they only attack young plants from 6 to 8 inches in height, and these had outgrown the attack by the time they had reached a height of 18 inches. A. H. Ritchie said that in Tanganyika, where the attack is at its worst from the middle of May till the end of June, a fungus is the most potent factor in the control of Aphids on cotton, and suggested that the control of Aphids and Jassids by fungi might be investigated.

**The Economic Status of Cotton Stainers** (*Dysdercus* spp.).—*Proc. S. & E. Afr. Agric. Conf., 1926*, pp. 238-242. Nairobi [? 1927].

This paper on *Dysdercus* (cotton stainers), of which the two species most prevalent on cotton in Southern Rhodesia are *D. intermedius*, Dist., and *D. nigrofasciatus*, Stål, deals chiefly with their possible agency in the transmission of plant diseases, particularly of boll rot. This disease has been known to occur in several instances in the absence of *Dysdercus*, and may possibly be due to other causes. Problems that remain unsolved in this connection are indicated as subjects for further investigation.

GRILLO (F. M.). [**Note on the natural Occurrence of major Pests of Cotton in relation to climatic Factors.**]—*Proc. S. & E. Afr. Agric. Conf., 1926*, pp. 179-180. Nairobi [? 1927].

The author discusses the effect of temperature and humidity on the major pests of cotton in Portuguese East Africa, showing the relative merits of late and early planting. Low yields, attributed to insect

injury, principally by bollworms [*Earias insulana*, Boisd., and *Heliothis obsoleta*, F.], occurred in cotton sown with the first rains, from December to February, and picked during the cold season from June to August. Attack by bollworms was to a great extent avoided by later planting, only slight damage by the Sudan bollworm [*Diparopsis castanea*, Hmps.] occurring and the yield being greatly increased, and it is believed that if irrigation were applied in August and September still better results might be obtained.

KIRKPATRICK (T. W.). **Biological Control of Insect Pests, with particular Reference to the Control of the Common Coffee Mealy Bug in Kenya Colony.**—*Proc. S. & E. Afr. Agric. Conf.*, 1926, pp. 184–196, 9 refs. Nairobi [? 1927].

This is a general account of the biological control of insect pests, the factors discussed being climate, food-plants, parasites and predators. The principles laid down are applied to the common coffee mealybugs, of which five species of the genus *Pseudococcus* occur in Kenya. The most abundant and dangerous of these has been identified as *P. citri*, Risso, usually known as a pest of *Citrus*; this mealybug has never been found on *Citrus* trees in Kenya, even when actually growing among infested coffee, and was unable to survive when artificially transferred to *Citrus*. Attempts to introduce an internal parasite of the *Citrus* form for the control of the coffee form would probably prove useless, and the latter, though anatomically identical with the former, must be considered for practical purposes a distinct biological species. Parasites of a similar form of *Pseudococcus* found feeding on a wild shrub could not be induced to attack the coffee mealybug. This species has been known to exist in the Colony since 1909; it is probably indigenous, but has spread to an alarming extent during the last three years, being now widely distributed over the coffee-growing area east of Nairobi. The altitude of infested areas usually lies between 5,000 and 5,700 ft., but the mealybug has been found at 6,500 ft. It breeds continuously on coffee throughout the year, development from egg to adult requiring 36 days for the female and 33 days for the male under laboratory conditions. The males number 10 per cent. of the total, though shade and high humidity may increase this percentage. Several generations can be produced parthenogenetically, but experiments point to the fact that this method of reproduction cannot continue indefinitely. The two main periods of abundance, which occur in October and March, coincide with the main flowering periods of coffee, though the causes influencing these seasons are not known with certainty. The mealybug is able to breed more prolifically when buds, flowers and young berries are available for its food; while rain has an adverse effect on some of its predatory enemies, its attendant ants, *Pheidole punctulata*, Mayr, are more abundant and active in damp weather. The controlling factor at high altitudes is cold. No reliable figures have been obtained in regard to the number of eggs laid by the mealybug in Kenya; the average number of larvae surviving half way through the first instar in the laboratory is 150. Other workers give the number of eggs laid by *P. citri* on *Citrus* as 300–600.

Artificial aids to climatic control of the mealybug consist of pruning the lowest branches and the avoidance of windbreaks to ensure free air circulation in and around the trees, in order to lower the humidity, a result that is aided by the rigorous suppression of weeds. In order

to destroy alternative food-plants round the plantation, a belt at least 50 yards wide should be cleared and either not planted at all or planted with some crop that cannot harbour the mealybug or any other coffee pest. Wind-borne infestation, however, cannot be controlled.

Though control by internal parasites is impracticable in the case of the coffee mealybug, only one exceedingly rare parasite being known in Kenya, nearly 40 insects predacious on it occur in the Colony. These are nine species of Psocoptera, the commonest of which is *Ectopsocus briggsi*, Mcl.; four Hemerobiids; two Chrysopids, *Notochrysa antica*, Wlk., and *Chrysopa* sp.; one Coniopterygid; four Lepidoptera, including *Eublemma costimacula*, Saalm., and two other moths the larvae of which are found on mealybugs, but do not appear to destroy the living insects; sixteen Coccinellids, including *Dysis quadrilineata*, Sic., *Chilomenes vicina*, Muls., *C. lunata*, F., *Alesia aurora*, Gerst., *A. posticalis*, Frm., *Exochomus nigromaculatus*, Goeze, *Platynaspis kollari*, Muls., *P. capicola*, Crotch, *Chilocorus discoideus*, Crotch, *C. angolensis*, Crotch, *Hyperaspis senegalensis*, Muls., *H. delicatula*, Muls., *Scymnus* sp., and *S. guttulatus*, Sic., the last five species being the most important; three Syrphids, *Syrphus adligatus*, Wied., *Xanthogramma calopus*, Lw., and *X. pfeifferi*, Big.; and an Agromyzid, *Leucopis* [africana, Mall.]. In a series of predators bred from infested coffee twigs collected in March 1926 the Psocoptera were the most numerous, while *Scymnus* sp., *H. delicatula* and *L. africana* were also abundant.

The effect of these predatory insects is modified to some extent by parasites. Those most heavily parasitised, *H. senegalensis* and *L. africana*, are, however, only attacked to the extent of about 10 per cent. The chief enemy of all the commoner predators is the ant, *Pheidole punctulata*, which attends the coffee mealybug for the sake of its sweet secretion and is known to destroy, in addition to many of the predacious insects named above, both adults and larvae of the imported Coccinellid, *Cryptolaemus montrouzieri*, Muls. Natural control is impossible where *P. punctulata* occurs, and it appears to be distributed over the greater part of the area where the coffee mealybug is found. In the one district where it has not been observed, the mealybug, though it occurs sporadically, does not appear to be an important pest. In this district another ant that accompanies the mealybug is not so destructive as *P. punctulata* to predatory insects, which are thus sufficiently numerous to keep the pest in check. It has been proved by experiment that where the ants are denied access to a coffee tree the mealybug can be eradicated, under favourable conditions, in five weeks, though a much longer period is required in some plantations. The only alternative to encouraging natural enemies is spraying, which, while failing to reach all the mealybugs, kills many of the predators, with the result that infestation subsequently becomes worse than before.

Poison baits have proved ineffectual in controlling *P. punctulata* [R.A.E., A, xiv, 552], and the use of calcium cyanide or hot water would be too costly where the nests are very numerous. Moreover, the nests may be situated at a depth of as much as a foot in dry weather, and the queens and immature stages are found near the surface only after rain, so that the number of days upon which they can be destroyed is limited. Total eradication should be attempted while the nests are still comparatively few in number. Fair results have been secured with a high boiling point creosote oil used as a repellent, but the

method of application is slow and difficult, and careless use may result in damage to young trees.

In the discussion that followed this paper it was stated in reply to a question that although termites attack *Grevillea robusta* in Kenya, they rarely attack coffee even when the two plants grow together.

HARGREAVES (H.). *Lycidocoris mimeticus*—a potential Pest of Coffee. —*Proc. S. & E. Afr. Agric. Conf., 1926*, pp. 196–198. Nairobi [? 1927].

*Lycidocoris mimeticus*, R. & P., was first recorded on coffee in Uganda in 1916, and although not responsible for much injury, is of considerable importance in view of the serious damage it is capable of causing under certain conditions. At first this Capsid was noticed only on coffee growing in dense shade, but in 1925 it occurred on unshaded coffee on part of one estate, where it appeared that it was favoured by some condition of the soil.

The female, the maximum longevity of which is 126 days as compared with 75 days in the case of the male, lays 4 eggs each day throughout the oviposition period, depositing them near the tips of stems and branches, the maximum number of eggs laid by one female in captivity being 454. The pre-oviposition period was found to be 10 days and the incubation period 18 days; the nymphal stage, consisting of 5 instars, during which considerable damage is done, lasts 22 days. The adults are very active, taking flight quickly when disturbed. Both nymphs and adults feed on young leaves and terminal buds, producing brown patches on the leaves and the ultimate death of the leaves and buds. Secondary growth is then produced and in its turn attacked, thus producing dense bushes on which no crop can be borne. The berries are not known to be attacked. The stages of the insect and its method of oviposition are described.

In the discussion that followed it was stated that *L. modestus*, Dist., had been reported on deeply shaded coffee in the Belgian Congo.

**Measures other than Hand-picking found practical for the Control of *Antestia* on Coffee.**—*Proc. S. & E. Afr. Agric. Conf., 1926*, pp. 199–200. Nairobi [? 1927].

Measures for the control of *Antestia* on coffee in Tanganyika and Kenya already noticed [*R.A.E.*, A, xiv, 229, 553] are discussed. H. Hargreaves said that in Uganda the bait-spray in use in Kenya [xiv, 553] caused serious scorching of the foliage; in order to avoid contact with the plant, strips of hessian were soaked in the poison and placed where the insects could reach them, but this method proved ineffective. A. H. Ritchie said that in Tanganyika washing off by rain was obviated by placing pieces of cloth soaked in a strong solution of the poison within the bush; bait-sprays containing sodium arsenite were effective at altitudes of 3,000 to 5,000 ft. in one region and at 4,500 to 5,000 ft. in another, and he concluded that both temperature and humidity had to be taken into account; bait-sprays containing lead arsenate (Mally formula [*R.A.E.*, A, i, 196]) were not satisfactory.

[**Miscellaneous Coffee Pests.**]—*Proc. S. & E. Afr. Agric. Conf., 1926*, pp. 200 & 204. Nairobi [? 1927].

T. J. Anderson said that the Tenebrionid, *Gonocephalum simplex*, F., attacking coffee in Kenya [*R.A.E.*, A, xii, 321] was completely con-

trolled by a bait of 60 lb. bran mixed with 1 lb. Paris green, spread around the bushes, 25 lb. of this mixture, without the addition of a sweetening agent, being sufficient for one acre of coffee.

A. H. Ritchie discussed the Coleoptera boring in coffee in Tanganyika [R.A.E., A, xv, 326], and also stated that considerable damage was done by *Heterodera radicicola*, Greeff (root eelworm) to coffee newly set out in fields previously planted with infested food crops; he understood that budding *Coffea arabica* on to *C. myrthifolia*, which is resistant to *H. radicicola*, was being considered in the Belgian Congo where this pest is becoming serious. C. Smee said that this eelworm was a serious pest of tobacco in Nyasaland; H. Wilkinson said that it occurred in Kenya without being a pest; H. Hargreaves said that it had not been reported as a pest of coffee in Uganda; C. Fuller stated that it was a serious pest of fruit trees in the Cape Province and was of the opinion that crop rotation or planting grass to rid the land of infestation was the only practicable method of control, as soil treatment appeared to be useless.

[**Papers on Coconut Cultivation.**—*Proc. S. & E. Afr. Agric. Conf.*, 1926, pp. 205–212 & 309–311. Nairobi [? 1927].

In a paper read by E. J. Welsford an account is given of gummosis in coconuts in all parts of the world. It is suggested that in Zanzibar where the disease is widespread, the probable cause is mal-nutrition due to lack of water or plant-food in the soil, inactive roots or poor soil aeration. It may also be local and due to the cutting off of the food-supply from the inflorescences, the result of mechanical injury caused by the rhinoceros beetle [*Oryctes monoceros*, Ol.], which has increased in recent years in Zanzibar. A. G. Bailey said that gummosis is also prevalent in the coastal area of Kenya, where it causes considerable loss. The disease, which was severe in poor shallow soil, was not observed on richer lands bordering rivers.

A. H. Ritchie stated that *O. monoceros* breeds extensively in the wild palms, *Borassus*, *Phoenix* and *Hyphaene*, and in decaying bases of sisal [*Agave sisalana*]. C. B. Hardenberg said that in Portuguese East Africa labourers are usually employed on coconut plantations to collect the adults of *O. monoceros* and *Rhynchophorus* and that the use of trunks of fallen trees as traps for the beetles for 2 or 3 months could be recommended, provided that diseased trees were not so employed and that they were not forgotten.

In a paper submitted by the Director of Agriculture, Seychelles, [P. R. Dupont] on the culture of coconuts in that Colony and various aspects of agricultural methods there adopted, it was stated that the indigenous beetle, *Melittomma* [*insulare*, Fairm.], has apparently acquired the habit of attacking the soft tissues of the stems of coconut, which is imported, owing to its original food-plants, on which it is no longer found, having been interplanted with the coconut palms over a long period. The same theory applies to *Pinnaaspis buxi*, Bch., which evidently originated from indigenous screw-pines (*Pandanus*), on which it was recorded over 20 years ago. Manuring as a means of combating pests by rendering the plant more resistant to disease is widely practised in Seychelles. In consequence of previous neglect of plantations a special strain of coconut palm, extremely resistant to adverse conditions, has apparently been evolved, and new varieties introduced with a view to producing bigger nuts have proved less suited to local conditions.

STOREY (H. H.). **Control of Streak Disease on Maize and Sugar Cane.**—*Proc. S. & E. Afr. Agric. Conf., 1926*, pp. 212–213. Nairobi [? 1927].

It has been proved that *Balclutha mbila*, Naude, the insect vector of streak disease in maize in South Africa, may survive in an infective condition through the winter from one season's maize crop to the next [*R.A.E.*, A, xv, 521]. This is believed to be the more important method of overwintering of the disease virus, secondary food-plants playing an unimportant part. Streak disease can be naturally controlled climatically, its occurrence being rare above 4,000 ft.

Streak disease in sugar-cane is now firmly established in South Africa, about 30 per cent. of the Uba cane (the variety grown almost exclusively in South Africa) now being diseased. While experiments have failed to show any standard varieties of maize resistant to streak disease, it has been observed that many varieties of sugar-cane are at present immune or highly resistant to it.

A. H. Ritchie said that on an experimental plot of maize in Tanganyika where there was 100 per cent. infection of streak disease, the insects present were *Aphis maidis*, Fitch, and *Peregrinus maidis*, Ashm.; he thought it possible that there might be vectors of the disease other than *B. mbila*.

Streak disease occurs in Kenya both on maize and sugar-cane, but so far it has not been possible to transmit it experimentally by insects.

STOREY (H. H.). **Rosette Disease of Ground Nuts.**—*Proc. S. & E. Afr. Agric. Conf., 1926*, pp. 213–214. Nairobi [? 1927].

The relation of *Aphis leguminosae*, Theo., to the transmission of rosette disease of ground-nuts [*Arachis hypogaea*] in South Africa has been fully established [*R.A.E.*, A, xiii, 524]. Endeavours are being made to discover the manner of overwintering of the virus, as offering the best basis for control measures. Early planting secures effective control in normal seasons, while roguing out of early diseased plants appears to check the later spread. Attempts are being made to select resistant strains within standard varieties. A. H. Ritchie said that in Tanganyika, where the disease has been long established, infection is more prevalent under unfavourable weather conditions and on exhausted soils, and that cases of high incidence of the disease could not always be correlated with sucking insects.

ANDERSON (T. J.). **Legislative Measures in the Control of Insect Pests and Plant Diseases.**—*Proc. S. & E. Afr. Agric. Conf., 1926*, pp. 322–328. Nairobi [? 1927].

This summary of the legislative measures in force in Kenya in relation to the control of insect pests and plant diseases discusses the existing regulations under the three categories, importation of plants, inspection of plantations, and plant quarantine. Certain plants and seeds, such as hemp and narcotics, are prohibited entry. Others, of which a list is given, on account of their liability to carry certain serious pests and diseases not at present known to occur in Kenya, are admitted only under permit from the Department of Agriculture. All consignments, whether admitted by permit or accompanied by certificate or not, are liable to inspection and treatment or destruction.

Since plant import inspection was inaugurated in 1908, no insect pest has been known to be introduced, and only two diseases, mosaic of sugar-cane and die-back of apples and pears. Before 1908 two insect pests, the red scale [*Chrysomphalus aurantii*, Mask.] and the cottony cushion scale [*Icerya purchasi*, Mask.] were introduced on *Citrus*.

ZACHER (F.). **Die Vorrats-, Speicher- und Materialschädlinge und ihre Bekämpfung.** [The Pests of Provisions, Storehouses, and Materials and their Control.]—xv+366 pp., 123 figs., 8 col. pls., 98 refs. Berlin, Paul Parey, 1927. Price Mks. 18.

This book, which aims at supplying the need for a comprehensive treatise on the pests of provisions, grains, stored goods, timber and other materials, is intended chiefly for merchants, manufacturers and agriculturists in Germany. The first section describes the types of pests attacking each class of product. The second contains accounts of the appearance, biology and control of the various pests, nearly all of which are insects. In the third section the various remedial measures are reviewed from a general standpoint.

TORKA (V.). *Angitia rufipes*, Grav., ein Parasit der Kohlweisslingsraupe. [*A. rufipes*, a Parasite of the Caterpillar of the Cabbage White.]—*Anz. Schädlingsk.*, iii, no. 8, p. 97, 1 fig. Berlin, 15th August 1927.

The Ichneumonid, *Angitia rufipes*, Grav., in Upper Silesia is a parasite of *Pieris brassicae*, L., this being a new host-record. Parasitised larvae were noticed shortly before the third moult, so that the parasite must oviposit in them when they are quite young. It pupates within the host larva. Material collected on 29th September 1926 yielded males on 10th October, the females appearing a little later. *A. rufipes* is of considerable value in checking *P. brassicae*, especially as most of the feeding of the caterpillars is done in the last instars.

MOLZ (E.). **Zur Frage des Geschlechtsverhältnisses des Rüben-nematoden *Heterodera schachtii*.** [The Question of the Proportion of the Sexes in the Beet Nematode.]—*Zeitschr. Pflanzenkrankh.*, xxxvii, no. 9–10, pp. 260–266, 1 fig., 9 refs. Stuttgart, 1927.

This paper criticises Dr. v. Sengbusch's conclusions regarding the proportion of the sexes in *Heterodera schachtii* [*R.A.E.*, A, xv, 204] and supports the author's previous work on this subject [A, x, 122].

BÖNING (K.). **Ueber die wechselseitige Uebertragbarkeit der Mosaik-krankheiten von Rübe und Spinat.** [On the reciprocal Transmission of the Mosaic Diseases of Beet and Spinach.]—*Centralbl. Bakt., Paras. Infekt.*, IIte Abt., lxxi, no. 15–24, pp. 490–497, 3 figs., 5 refs. Jena, 30th August 1927.

In experiments *Aphis fabae*, Scop., and *Macrosiphum* sp. transmitted mosaic in Germany from diseased to healthy spinach, and also from beet to spinach. *Macrosiphum* sp. transmitted the disease from spinach to beet, but no experiment with *A. fabae* in this transmission is recorded. When spinach was placed in the field among infected seed-beets that

had become free from Aphids but were strongly infested by thrips (possibly *Thrips tabaci*, Lind.), it became infected, thus indicating that thrips may be carriers.

**Wetenschappelijke mededeelingen.** [Scientific Communications to the Netherlands Entomological Society.]—*Tijdschr. Ent.*, lxx, no. 1, pp. vii-1. Amsterdam, August 1927.

A new mite, *Tarsonemus aurantii*, sp. n., is described by A. C. Oudemans from oranges. A specimen of the Cynipid, *Cothonaspis rapae*, Westw., has been bred from pupae of the cabbage fly, *Phorbia* (*Hylemyia*) *brassicae*, Bch., in Holland, this being the first indisputable record of it from the Continent.

EGGERS (H.). **Zwei neue Borkenkäfer (Ipidae) von den Canarischen Inseln.** [Two new Bark-beetles from the Canary Islands.]—*Tijdschr. Ent.*, lxx, no. 1, pp. 37-40. Amsterdam, August 1927.

*Dactylotrypes uyttensboogaarti*, gen. et sp. n., is described from the seeds of date palms (*Phoenix canariensis*) from Grand Canary.

UYTTENSBOOGAART (D. L.). **Some Remarks regarding the Discovery and the Biology of *Dactylotrypes uyttensboogaarti* Eggers.**—*Tijdschr. Ent.*, lxx, no. 1, pp. 40-42. Amsterdam, August 1927.

The Scolytid, *Dactylotrypes uyttensboogaarti*, described in the preceding paper, was found in numbers in Holland in July 1925 in seeds of *Phoenix canariensis* collected in Grand Canary in March. On the supply of the seeds being exhausted, the beetles readily bored into the hard seeds of preserved Algerian dates (*P. dactylifera*). After some days they emerged and died. Succeeding generations appeared in December 1925, May 1926, October 1926, and February 1927. The beetles do not attack the pulp of the dates, but if a hole is made through it they enter and infest the stone. A number of the Lathridiid, *Melanophthalma gibbosa*, Hbst. (*tenella*, Woll.), also emerged from the original seeds of *P. canariensis*.

HASE (A.). **Ueber die Ausbildung in der angewandten Entomologie.** [On Education in Applied Entomology.]—*Ent. Mitt.*, xvi, no. 5, pp. 382-410. Berlin, 1st September 1927.

The importance of economic entomology, and the great need for an adequate number of properly trained practical entomologists are discussed, and the lines that their training should follow are indicated. A brief account is given of the entomological curricula now existing in various countries.

MALENOTTI (E.). **L'impiego dei fitofarmachi in rapporto all'apicoltura.** [The Use of Chemicals in Plant Protection in Relation to Apiculture.]—*R. Osserv. Fitopat.*, 7 pp. Verona, August 1927.

The conclusion reached in this report is that no alarm need be felt as to danger to bees from the various insecticide and fungicide materials

now largely used. There is nothing to be gained by spraying fruit trees in full bloom, and it is only at that period that harm can accrue to bees [*R.A.E.*, A, xiv, 408].

ARNAUD (M.). **Recherches préliminaires sur les champignons entomophytes.**—*Ann. Epiphyties*, xiii, no. 1, pp. 1–30, 17 figs., 4 refs. Paris, January–February 1927. [Recd. July 1927.]

Experiments were carried out with *Beauveria bassiana*, *B. densa*, *B. globulifera* and *Spicaria* sp. in order to determine the influence of temperature on the development of these fungi in cultures on potato; the influence of temperature, humidity and the method of applying the spores of *Beauveria* on the progress of infection in *Bombyx mori*, L., and *Pieris brassicae*, L.; and the effect of culture on artificial media (sterilised potato) upon the virulence of the fungi. Studies were also made of the manner in which the fungi penetrate the host.

For cultures on sterilised potato the optimum temperature proved to be about 22° C. [71·6° F.] for *B. densa*, and about 28° C. [82·4° F.] for *B. bassiana*. Development ceases at about 40° C. [104° F.], the spores being able to survive this temperature, though they are all killed at 45° C. [113° F.]. *B. bassiana* is rather more resistant to heat than *B. densa*.

Larvae of *Bombyx mori* and *P. brassicae* can be easily infected with any of the four fungi by placing them in contact with sporulated cultures, or by sprinkling spores over them or over the leaves on which they feed, *B. bassiana* being the most active under the conditions of the experiments. Larvae of *Agriotes* (wireworms) are very resistant, and perhaps even immune from infection.

A high degree of humidity is apparently favourable to infection, but infected larvae confined indefinitely in a humid atmosphere live longer than those re-exposed to the air after a confinement of 24 hours.

The results of experiments to determine the influence of temperature on the development of *B. bassiana* in the larvae were not well defined, but a temperature as low as 6° C. [42·8° F.] retarded its action on *P. brassicae*, and the optimum temperature for development in *B. mori* was about 25° C. [77° F.], while the mortality of the larvae diminished steadily after 30° C. [86° F.] was exceeded.

Although not absolutely conclusive, the experiments made provide strong support for the hypothesis that the fungi studied are capable of infecting the larvae by penetrating the skin, and there is no doubt that they can penetrate the chitin of infected larvae in order to effect an exit. No diminution in infectivity to insects was observed during two years in which cultures taken from one original stock of *B. bassiana* were maintained on artificial media.

VERGUIN (J.). **La mouche des cerises (*Rhagoletis cerasi*, L.); état actuel de la question.**—*Ann. Epiphyties*, xiii, no. 1, pp. 31–42, 30 refs. Paris, January–February 1927. [Recd. July 1927.]

The biology and distribution of *Rhagoletis cerasi*, L., are discussed, and the various stages of this fruit-fly are described. The bulk of the information as to the varieties of cherry attacked in France and the possible methods of control have already been noticed [*R.A.E.*, A, xv, 103, 487].

The author states that Dr. Villeneuve, in a letter written in 1910, recorded another fruit-fly, *Herina frondescens*, L., as attacking cherry.

GÉNIEYS (P.). **Un ennemi des rosiers, le *Coraebus rubi*.**—*Ann. Epiphyties*, xiii, no. 1, pp. 48–78, 2 pls., 8 figs., 47 refs. Paris, January–February 1927. [Reed. July 1927.]

This is a detailed account of the Buprestid, *Coraebus rubi*, L., which has recently caused serious damage to roses grown for perfume and other purposes in the South of France, and has made it necessary to uproot from 40 to 80 per cent. of the rose-trees within two or three years. As soon as replanting is effected, fresh damage occurs and increases steadily from year to year. Low bushes suffer more than standards, which can be deprived of one or two branches without serious loss to the crop of flowers. The damage becomes apparent at the end of the summer when the plant resumes activity after a latent period due to drought.

A description of the insect is given and its food-plants are discussed ; it is apparently confined to various species of blackberry (*Rubus*) and rose. While *Rosa centifolia*, the species cultivated for perfume in Provence, is heavily attacked, *Rosa damascena* appears to suffer little damage ; the latter is the species cultivated in Bulgaria, and although *C. rubi* occurs there on blackberry it is not known to damage roses. *Rosa indica* (tea rose), which is widely grown on the Mediterranean coast owing to its particular suitability to dry soil, is also a favourite food-plant, but *Rosa canina* (dog rose) does not appear to be attacked. The great increase of blackberries since the war has probably been largely responsible for the recent abundance of *C. rubi*.

The adults appear about the end of May and frequent sheltered spots exposed to the sun, feeding on the fully developed tissue of the leaves, which they eat from the edges, rarely puncturing the centres. The males may live from 4 to 5 weeks, and the females for 7 or 8. Oviposition begins 15 to 18 days after emergence. The eggs are laid near the ground on medium-sized stems and covered with a viscous liquid that sets into a rigid protective covering, the female being capable of laying from 40 to 50 eggs at the rate of one or two a day. The larva hatches in 18–20 days, and pierces the bark within an hour after hatching. In the course of about 60 days the larva tunnels downwards in a clockwise spiral, keeping close to the bark. The third moult then takes place and the larva tunnels deeper into the stem ; the downward movement is still maintained, but the spirals tend to close up. After possibly a fourth moult, at the end of December or beginning of January, the larva begins to ascend the stem, either in the wood or in the pith, following a more or less straight course at the end of which it pupates, close to the bark, at a point approximately corresponding to its entry into the stem. The greatest damage is done at the turning point, usually about 10 in. below the point of entry. Here the close proximity of the spirals cuts off the supply of sap. The ascent of the stem takes from  $2\frac{1}{2}$  to  $3\frac{1}{2}$  months, the short period elapsing between pupation and emergence of the adult varying according to temperature. A detailed description of the larva is given.

Several natural enemies of *C. rubi* have been recorded, but the author has never observed any. The spread of the insect is limited by the fact that one plant rarely harbours more than a single larva, it

being impossible for more than one to develop in a stem. In strong plants with abundant foliage the sap appears to suffocate the larva, while weakly or withered plants do not afford sufficient nourishment for the young larva to complete its development. Sudden heavy storms in fine weather destroy many adults, as they drop to the ground when the rain begins to fall and lie motionless, as they would to escape an enemy, and become embedded in mud.

Remedial measures include the uprooting and burning of blackberries in the neighbourhood of rose plantations. It is usually also advisable to destroy infested rose bushes unless they are particularly strong. Though the author has experimented with a number of chemicals in the form of sprays, dusts and fumigants as contact insecticides against both adults and larvae, and as stomach poisons and repellents against the adults, the only treatment he advocates is 3 or 4 applications of a 1 per cent. solution of diplumbic lead arsenate between 15th May and 10th June, which he believes to be effective against the adults only. This solution may be added to a copper sulphate or lime-sulphur spray used against fungous diseases. None of the materials tried against the larvae yielded appreciable results, though further tests of fumigation with hydrocyanic acid gas and chloropicrin and of the use of calcium cyanide seem desirable. Manuring and watering of the plants in June, July and August will promote the growth of foliage and an abundant supply of sap, which is inimical to the larvae. Hand collection of the adults in the early morning, by shaking them into nets or a vessel containing water, is also recommended.

ACHARD (E.). **Note sur l'emploi de quatre insecticides.**—*Syrie : Minist. Agric. etc.*, 12 pp., typescript, 1 table. Damascus, 22nd June 1927.

This is an account of experiments carried out in Damascus against *Dociostaurus maroccanus*, Thunb., and *Eurygaster integriceps*, Puton, with a proprietary arsenical poisoned bait, a proprietary pyrethrum soap and Cyanogas calcium cyanide "A" and "S" [*R. A. E.*, A, xiv, 74, 555]. Against larvae of *D. maroccanus* from 3 to 10 days old, the arsenical bait, which takes the form of a moist, light powder, easily spread in the track of the locusts, proved the most effective and cheapest of these materials, as its use involves little labour. A mortality of 100 per cent. was secured in 20 hours from applications at the rate of 53 lb. to the acre.

The proprietary pyrethrum soap at 4 per cent. strength had been previously used with success against larvae apparently of *Cimex quadrimaculata humeralis*, Geoffr., and *Nygma phacorrhoea*, Don., which defoliated almonds in various parts of Syria. In the experiments against *D. maroccanus* in spring, 95 per cent. mortality was secured in 30 minutes after the application of a 5 per cent. solution at the rate of 60 gals. to the acre. The experiments were carried out at 6 a.m., while the larvae were still inactive owing to the cold of the night. Although the cost of this method is considerably higher than that of using the bait, it is less than that of the use of barriers and traps and involves no risk to poultry or cattle as does the arsenical.

This material gave negative results against adults of *E. integriceps* on wheat, but was effective against larvae of all ages, 85 per cent. mortality being secured in 2 minutes with a 7 per cent. solution at the rate of 70 gals. of spray to the acre. An experiment with a smaller

quantity of 5 per cent. solution secured 70 per cent. mortality in 3 minutes in the case of the younger larvae, though they were in many cases deeply embedded between the husks of wheat, 5 to 10 minutes being required in the case of the older larvae to secure 50 per cent. mortality.

Cyanogas "A" gave no results against the active fourth instar larvae of *D. maroccanus* in the open, but when scattered at the rate of 44 lb. to the acre proved instantly fatal to almost all third instar larvae and killed many of the younger larvae in a swarm that shortly afterwards passed over the treated area. An experiment with Cyanogas "S" gave similar, though less rapid, results.

Cyanogas "A" was used against adults and larvae of all ages of *E. integriceps*; in the most successful case 90 per cent. mortality was secured in 5 minutes by an application at the rate of 8½ lb. to the acre. The application was made at 8 a.m. with a slight breeze, which helped to diffuse the hydrocyanic acid. In other cases, however, the results were less successful, even though a considerably larger amount of the insecticide was used to the acre.

RESSENCOURT (M.). **Recherches expérimentales pour l'amélioration de la sériculture au Tonkin.**—*Bull. écon. Indochine*, no. 186, pp. 237–258. Hanoi, 1927.

While admitting the probable advantage of introducing foreign races of silkworms [*Bombyx mori*] with better qualities than the native ones into Indo-China for the purpose of improving the silkworm industry there, the author has thoroughly investigated the native methods of rearing silkworms and has compared these with the standard methods. The differences are explained and the results have shown that considerable improvement in the present condition of the industry could be obtained if the methods outlined were followed.

GIMINGHAM (C. T.) & TATTERSFIELD (F.). **Laboratory and Field Experiments on the Use of 3:5-Dinitro-o-Cresol and the Sodium Salt for Winter Spraying.**—*Jl. Agric. Sci.*, xvii, pt. 2, pp. 162–180, 1 fig., 7 refs. Cambridge, April 1927.

The experiments described in this paper confirm the results previously obtained as to the high toxicity of dinitro-cresol and sodium dinitro-cresylate (strength calculated as dinitro-cresol) to insect eggs [*R.A.E.*, A, xiv, 514]. In laboratory experiments 100 per cent. of the eggs of *Cheimatobia brumata*, L., were killed by dinitro-cresol at 0.2 per cent. (gm. to 100 cc.), and 70–100 per cent. at 0.1 per cent. The results previously obtained with eggs of *Selenia tetralunaria*, Hufn., were confirmed, and in a series of experiments with the ammonium salt of dinitro-cresol results agreeing very closely with those given by the sodium salt were obtained, but the potassium and barium salts, tested on small numbers of eggs, were apparently considerably less toxic. Both dinitro-cresol and sodium dinitro-cresylate were completely toxic to eggs of *Polia (Hadena) oleracea*, L., at concentrations of 0.05 per cent. and above; dinitro-cresol could not, however, be used in practice for the control of *P. oleracea*, as the eggs are laid on the leaves, which would be injured by it.

Eggs of *Abraxas grossulariata*, L., were apparently unusually resistant to penetration by dinitro-cresol, but many of the larvae died on emergence and 80–100 per cent. were finally killed by concentrations

of 0.3-0.1 per cent. Dinitro-cresol and sodium dinitro-cresylate killed 90 and 73 per cent., respectively, of the eggs of *Notolophus* (*Orgyia*) *antiquus*, L., at 0.05 per cent., and 100 per cent. at all higher strengths tested. All concentrations of either substance down to 0.025 per cent. were completely toxic to eggs of *Tortrix pronubana*, Hb., which were the least resistant of any species tested. Tests with eggs of *S. tetralunaria* and *P. oleracea* showed that with concentrations of 0.1 per cent. and above, the toxicity of dinitro-cresol is little affected by washing with water provided that it is allowed to dry first. Sodium dinitro-cresylate is more affected; at 0.25 per cent. the toxicity is appreciably lessened by washing 4 hours after spraying, but it is not affected 24 hours after spraying, while at lower concentrations the effect of washing is more marked. Little toxic effect is shown by either chemical on eggs washed before it has dried.

In field tests on apples, applications of dinitro-cresol and sodium dinitro-cresylate at 0.25 per cent. were made on 17th and 18th February, when many of the buds on some of the trees had begun to swell. Rain began to fall about an hour after the spraying with dinitro-cresol had been completed. On 19th April, when hatching of eggs of *Psylla mali*, Schmidb., and Aphids was considered to be complete, examination of buds from sprayed and unsprayed trees showed that *Aphis pomi*, DeG., *Anuraphis roseus*, Bak., and *P. mali* were almost completely controlled both by dinitro-cresol and sodium dinitro-cresylate, and that the numbers of caterpillars (mainly *Cheimatobia brumata*) had been greatly reduced; a few Capsid nymphs of a non-injurious species were found, however, and there was no indication that the sprays had affected their numbers. Both sprays had a marked general cleansing effect on the trees, which were not injured in any way. A plum tree sprayed with sodium dinitro-cresylate remained almost free from Aphid attack throughout the season, while neighbouring unsprayed trees were severely attacked, and this tree alone bore fruit.

Black currant bushes of two varieties, on one of which the buds had already burst, were sprayed on 13th February with 0.25 per cent. dinitro-cresol and sodium dinitro-cresylate solutions. With the exception of a negligible yellowing of the edges of a few of the first leaves of the more forward variety, no injury resulted, and in May the bushes were almost free from Aphid attack, which was severe on unsprayed bushes, and they remained much freer from infestation throughout the season.

The authors conclude that dinitro-cresol and sodium dinitro-cresylate are suitable for use in winter spraying of dormant trees and bushes, and that although they differ little in toxicity, the sodium salt, being more soluble in water, may be more readily washed off if rain falls immediately after spraying. They also suggest that similar results would probably be obtained with 2:4 dinitro-phenol and its sodium salt, which, like sodium dinitro-cresylate, is known to have fungicidal properties.

TATTERSFIELD (F.). **The Relationship between the chemical Constitution of Organic Compounds and their Toxicity to Insects.**—*Jl. Agric. Sci.*, xvii, pt. 2, pp. 181-208, 3 figs., 42 refs. Cambridge, April 1927.

In this paper, which is based on investigations on the toxicity to insects of a very large number of organic compounds, the results of most

of which have been noticed in this *Review* in the last few years, the author attempts to analyse the factors that determine toxicity. He concludes that there is little probability of finding one simple generalisation capable of explaining the variations in toxicity of the compounds examined. The particular physiological actions to which compounds give rise are dependent upon chemical constitution, and the type of molecule will therefore have a paramount influence upon toxicity, but physical properties, many of which are, however, bound up with molecular constitution, will play an important part in regulating and modifying the intensity of toxic action.

All the compounds studied were tested as contact insecticides, a contact insecticide being defined as one that is brought into external contact with the insect as solid, liquid or vapour. As regards the relationship between chemical constitution and insecticidal action of certain compounds in the vapour phase [*cf. R.A.E.*, A, ix, 320] there is a rough correlation between both molecular weight and volatility and toxicity, but it is probable that these relationships are only indirectly involved, and that they indicate a connection of a more direct kind with some other property, such as adsorption.

The discussion of substances tested in spray fluids deals first with plant products [*R.A.E.*, A, xi, 249; xiii, 158; xiv, 512] and then with synthetic organic compounds, nearly all of which have received more detailed treatment elsewhere [xiii, 362; xv, 367]. As previously stated [xiii, 363], the substitution of chlorine in the benzene ring produces increased toxicity with each successive chlorine atom up to three, but later work has shown that further chlorination reduces toxicity, tetrachlor- and hexachlorbenzene being less toxic than trichlorbenzene. Trinitrobenzene is very difficult to suspend in a form suitable for spraying, and on the only occasion on which it was used, against eggs of *Polia (Hadena) oleracea*, L., it proved less toxic than dinitrobenzene. With regard to the hydroxyl derivatives of benzene, phenol (monohydroxybenzene) has a comparatively low toxicity to *Aphis rumicis*, L., 3.5 gm. to 100 cc. being necessary to give complete control, and the di- and trihydroxybenzenes (*e.g.* pyrocatechol and pyrogallol) are even less toxic; anisole (monomethoxybenzene) is less toxic to *A. rumicis* than phenol, but veratrole (1:2-dimethoxybenzene) and 1:2:3-trimethoxybenzene are more toxic, 2 gm. of the former and 1 gm. of the latter to 100 cc. giving complete control.

THEOBALD (F. V.). **An Attack of Cockchafer Larvae on Grass Land and some Experiments in Connection with their Control.**—*Jl. S.-E. Agric. Coll.*, no. 24, pp. 40-43, 1 fig. Wye, Kent, 1927.

During hay-making in 1924, the grass in a number of fields in Kent was found to be seriously damaged by larvae of the cockchafer, *Melolontha melolontha*, L. (*vulgaris*, F.), which were in their second year of development. The number to the square foot varied considerably; in some cases as many as 40 were counted and in one case 60, but the average was 25. Most of the larvae occurred from just under the surface of the soil to a depth of 4 inches; they were still feeding at the end of October, but towards the end of November their numbers decreased among the roots, and by January they were all at a depth of 9-12 inches below the surface. The grass had thus a chance to

recover before the larvae returned to the surface at the beginning of March.

Experiments with naphthalene, kainit, acetylene waste and gas lime were not successful. Even when applied at the rate of 6 cwt. to the acre neither kainit nor naphthalene had any appreciable effect on the larvae (though the former stimulated the recovery of the grass in winter), while they apparently had a repellent effect on birds, which are the chief natural enemies of this beetle.

Mechanical measures proved more effective and cheaper; the land was rolled in October with a steam roller (a ring roller not being heavy enough), which destroyed from 70 to 100 per cent. of the grubs. The results were much better where the land was firm than where it was spongy and wet. When it was reasonably dry, 5 acres could be covered in a day at an inclusive cost of 10s. an acre, while 1 cwt. naphthalene costs 15s., exclusive of transport and labour.

THEOBALD (F. V.). **Caterpillars and Plant Lice attacking Chrysanthemums under Glass.**—*Jl. S.-E. Agric. Coll.*, no. 24, pp. 44–50, 4 figs. Wye, Kent, 1927.

This is a short account of the Lepidopterous larvae and Aphids that attack chrysanthemums under glass. *Brotolomia* (*Phlogophora*) *meticulosa*, L., is becoming more and more abundant; under glass the broods overlap, and the adults appear throughout the winter. The eggs, which are laid singly or in groups on the leaves, hatch in 2 weeks, and the larvae mature in 5–7 weeks; they pupate in the soil and in the winter the moths emerge 2–4 weeks later. Other food-plants are violets, attacked both in the open and in cold-frames, primroses, docks, groundsel and chickweed. The larvae of *Polia* (*Hadena*) *oleracea*, L., frequently occur on chrysanthemums with *B. meticulosa*; they also attack tomatos and cucumbers under glass. The larvae of *Euxoa* (*Agrotis*) *segetum*, Schiff., are also common in chrysanthemum houses, attacking the roots, young plants and lower leaves; they develop rapidly, and the moths occur throughout the winter. *Naenia typica*, L., may occasionally damage late chrysanthemums; the moths appear in July and August and lay their eggs in clusters on the upper surface of the leaves of plum, pear and apple; the larvae feed on these plants for 2–3 weeks, after which they disperse and feed on low plants such as lettuce, cabbage, spinach and dock, until well on into the autumn, and hibernate under leaves and rubbish or just below the surface of the soil; sometimes the larvae enter greenhouses, where they feed throughout the winter and pupate in the soil in the spring.

Large numbers of the moths of the first three Noctuids may be caught by hanging up bottles containing beer and sugar. Young plants may be sprayed with lead arsenate as an additional measure, and if *E. segetum* is known to be present, poison baits of bran and Paris green should be placed in small heaps on the soil.

The Aphids dealt with are *Macrosiphum* (*Macrosiphoniella*) *sanborni*, Gill., *M. lineatum*, v.d.G., *Myzus circumflexus*, Buckt., *M. persicae*, Sulz., *M. duffieldi*, Theo., *Anuraphis helichrysi*, Kalt., and *Aphis rumicis*, L. If the houses are not too wide the plants should be sprayed with nicotine and soft soap before flowering; when they are in flower it is best to fumigate at intervals with tobacco shreds.

THEOBALD (F. V.). **The Scarcity of Aphides in 1924 in Southern Britain.**—*Jl. S.-E. Agric. Coll.*, no. 24, pp. 51–53. Wye, Kent, 1927.

In the autumn of 1923 sexual forms of various Aphids were numerous in the south of Britain, suggesting the possibility of heavy infestations in 1924. The unfavourable weather conditions prevailing in late winter and early spring, however, were responsible for a high mortality among the young Aphids at the time of hatching and later. Notes are given on the species recorded during 1924, which, almost without exception, were very scarce on both wild and cultivated plants.

BARNES (H. F.) & THEOBALD (F. V.). **A new Gall Midge attacking *Arabis albida*.**—*Jl. S.-E. Agric. Coll.*, no. 24, pp. 54–55, 1 fig. Wye, Kent, 1927.

The Cecidomyiid, *Dasyneura arabis*, Barnes, sp. n., which is here described from west Surrey, destroys the whole central growth of *Arabis albida*. In 1926 the larvae left the galls from November to mid-December and pupated in the soil; the adults emerged in the following May. The damage was so extensive in one garden that all the plants were burnt, and this measure is recommended for all infested plants. In addition it is advisable to apply naphthalene (4 oz. to the square yard), or some other soil insecticide, to the soil in which infested plants have been grown.

DUFFIELD (C. A. W.). **The Beet Eelworm (*Heterodera schachtii* (Schmidt)) : its Life History when found on Hops in this Country.**—*Jl. S.-E. Agric. Coll.*, no. 24, pp. 56–58, 2 graphs. Wye, Kent, 1927.

Observations carried out at weekly intervals over a period of three years showed that the life-history of *Heterodera schachtii*, Schm., on hops in Great Britain, where there is only one generation a year, differs considerably from that on beet on the Continent, where there are several generations. The female hibernates attached to the finer fibrous roots, being at this stage merely a brown, shiny, citron-shaped cyst containing from 50 to 150 eggs. During March these eggs are found to contain developed young, which emerge between April and July and leave the female cyst; after living for a short time free in the soil the larvae bore into new roots within a short distance of their dead parent, being too weak to travel far, and take up their position just below the cuticle, where they gradually assume the citron shape, the pressure caused by their growth bursting the skin of the root and leaving the females visible as white bodies. The earliest appearances of the females occurred between 9th and 18th June, and mature females, which assume a brown colour, were first seen between 3rd and 10th August. The only males observed occurred sparingly in the summer months, while the females were at the white, immature stage. They are eel-like in form and are able to work through the soil in search of maturing females.

DUFFIELD (C. A. W.). **The Blossom Beetle (*Meligethes aeneus*) attacking the Seed Crop of Swedes, etc.**—*Jl. S.-E. Agric. Coll.*, no. 24, pp. 59–63, 9 refs. Wye, Kent, 1927.

Severe losses have been caused in all localities where swedes are grown for seed in Britain, particularly in parts of Kent, and also in

other countries, by insects attacking the flowers ; in one case in 1922 the damage was estimated at £30 an acre over 25 acres of seed. Three insects affecting seed production in cruciferous root crops, the blossom beetle, *Meligethes aeneus*, F., the seed weevil, *Ceuthorrhynchus assimilis*, Payk., and the seed midge, *Dasyneura brassicae*, Winn., are known all over Europe, although their relative importance varies in different countries. *D. brassicae* was reported as doing serious damage in Kent in 1911, but the author found from 1922 to 1924 that *M. aeneus* was responsible for nearly all the damage, this beetle representing about 85 per cent. of the insects collected on ten occasions in each of the three years from 120 plants. *C. assimilis* caused little damage and *D. brassicae* none.

The stages of *M. aeneus* are described, and the nature of the damage that it does in England and other countries is discussed. It has been stated that the beetles feed solely on pollen and only injure the unopened buds to obtain it in cold weather [*R.A.E.*, A, viii, 488 ; ix, 64], but the author found that they destroyed both the buds and flowers of swedes, in all weathers, but especially during hot, dry spells, although they fed on pollen as well.

The adults hibernate in rubbish, haystacks or stubble, or just below the surface of the ground, and appear in swarms with the first warm weather in April or May, being found first on flowers of daffodils or other bulbs, then on those of cruciferous weeds, especially charlock, and finally on the blossom buds of swedes. As soon as the flowers are open the eggs are laid, and in about four days the young larvae may be found at the base of the pistil and anthers ; the larvae feed for about 10 days in the flowers, to which the author believes that they do a certain amount of damage, particularly when there is a shortage of pollen, and drop to the ground when fully fed to pupate. The adults appear in about 15 days and fly off to wild crucifers or backward swede blossoms. It is not known whether there is a second generation on wild plants, but there has been no evidence of pairing, and all attempts to breed a second generation have failed ; it is thought that these adults hibernate and pair in the spring [*cf. R.A.E.*, A, xiv, 433].

Spraying plants with lead arsenate or Paris green when they are in bud proved ineffectual as a means of controlling the beetles. Paraffin used as a repellent gave better results, but it is essential that the weather should be fine for some days after spraying, and two or three applications a week are necessary when the migration of the beetles to swedes is at its height. The best results have been obtained by mechanical methods, several of which are described. The most successful instrument appears to be a piece of thin board with a half circle cut out on one side enabling it to fit round the plant. A handle is fixed on one side, midway between the outer straight edge and the half circle, and a piece of grease-smeared paper is pinned on the board on which the beetles are shaken from the plant by means of a broad and flat implement such as a wicker carpet-beater, which is less likely to damage the plant than a stick.

Securing good growth before seedlings are planted out will do much to prevent serious damage, as more laterals will be thrown out if the plant is strong and healthy, and consequently more flowers, while early blossoming will give the pods time to grow before the migration of the beetles. All cruciferous weeds must be kept down, as these harbour beetles that may subsequently migrate to the crop, when the wild food-plant withers first.

BARNES (H. F.). **Material for a Monograph of the British Cecidomyidae or Gall Midges. British Gall Midges of economic Importance.** I-V.—*Jl. S.-E. Agric. Coll.*, no. 24, pp. 65-146, 11 pp. refs. Wye, Kent, July 1927. Price (reprint), 3s. 6d.

In addition to being a compilation of the available information on British Cecidomyiids of economic importance, this paper incorporates some new information that has not previously been published. In these five parts the author deals with the species attacking cereals, fodder crops, fruit, vegetables, hops, violets, roses and chrysanthemums. The original (or first available) description of each species is given, followed by an account of its life-history, natural enemies, distribution, economic importance and control.

THEOBALD (F. V.). **Capsid Bugs (Capsidae) on Fruit Trees.**—*Jl. Kent Farmers' Union*, xxi, no. 6, reprint, 7 pp., 3 figs. Maidstone, June 1927.

The Capsids attacking apple in England include *Plesiocoris rugicollis*, Fall., *Lygus pabulinus*, L., *Calocoris fulvomaculatus*, DeG., *Orthotylus marginalis*, Reut., *Atractotomus mali*, Meyer, and *Psallus ambiguus*, Fall. The first four species also occur on currants. An account is given of the life-history and habits of *P. rugicollis*, which is by far the most destructive. The control measure recommended is spraying the trees with 3 oz. nicotine (96-98 per cent.) and 4 lb. soft soap in 40 gals. water; this spray should be applied heavily with a coarse nozzle about a week before the flowers open and again just after the petals have fallen. For the Capsid nymphs to be killed they must be hit by the spray, but many may fall to the ground as a result of the spray without being touched by it, and will subsequently crawl up the trunk into the tree. For the treatment to be successful it is essential that these nymphs should be destroyed; this may be done either by placing adhesive bands on the trunks, or, in the case of bush apples or currants, by spraying the ground. Dusting with nicotine has also proved satisfactory, but the same precautions should be taken to prevent the return of the insects that fall to the ground unharmed, and good results have been obtained by washing the trees heavily with water and banding the trunks.

LLOYD (LI.). **The selective Action of Tetrachlorethane as a Greenhouse Fumigant.**—*Gdnrs'. Chron.*, lxxxii, no. 2125, pp. 232-233, 2 refs. London, 17th September 1927.

The author puts forward the suggestion that the fact that tetrachlorethane, when used as a fumigant in greenhouses, affects certain plants adversely and has no effect on others may be accounted for in the same way as the fact that it is toxic to whiteflies [*Trialeurodes vaporariorum*, Westw.] but not to Aphids. In the proportions used it is not a tissue poison, but a wax solvent, and therefore affects the respiratory apparatus of the whiteflies, all stages of which are covered with wax. In the same way it may act also as a mechanical poison to plants such as chrysanthemum and cineraria, the foliage of which feels waxy to the touch.

STEWART (A. M.). **Some Destructive Household Insects and how to combat them.**—Cr. 8vo, 47 pp., 5 pls. Paisley, A. Gardner, 1927. Price, Boards, 2s. net.

This small handbook deals in a popular and practical manner with such household pests as furniture beetles, clothes moths, cockroaches, and house-flies, with an account of their appearance and habits, and recommendations for their control, based upon many years' investigations and experience.

MUNRO (J. W.). **The present Position of Forest Entomology in Great Britain.**—*Forestry*, i, no. 1, pp. 44-46. London, 1927.

The history of forest entomology in Great Britain is briefly reviewed, and problems calling for future investigation are enumerated. One of the most urgent of these is the discovery of a method for controlling beetles of the genus *Lyctus* imported from America in consignments of oak and ash. An efficient forest entomological service has still to be organised in order to prevent the importation of pests of forest trees. Further work is also required on the biology of numerous insects that appear at present to be merely minor pests, as with the growth of the existing new plantations and the commencement of thinning their importance may greatly increase.

FROGGATT (W. W.). **Forest Insects and Timber Borers.**—8vo, iv + 107 pp., 31 pls. Sydney, Govt. Printer, 1927.

This volume consists largely of a series of articles that have been published by the author during the past three years, during which he has held a special appointment for the study of problems of forest entomology in Australia. The main outline follows that of a previous work, in which many of the forest pests were dealt with [*R.A.E.*, A, xi, 559]. An account is given of each species, most of them being figured and discussed, with notes on their life-histories and habits, and a catalogue of the described species of Bostrychids known in Australia is included. With regard to timber-boring species, the author is convinced, as a result of his practical experience in dealing with these problems, that with very reasonable expense all the valuable timbers, after being cut up on the saw bench, could be protected from powder-post beetles (Lyctids) during the period of seasoning, after which they are immune from infestation. Various treatments with crude oil or creosote mixture are suggested for this purpose. Logs liable to infestation with pin-hole borers (Scolytids) should be sprayed or painted with an adhesive repellent mixture of creosote, tar and oil. Scattering sawdust moistened with carbolic solution among the layers of timber as the stack is being built will repel pin-hole borers and probably powder-post beetles also.

VAN DER MERWE (C. P.). **The Sweet Potato Weevil** (*Cylas formicarius*, F.).—*Union S. Africa Dept. Agric.*, Bull. 14, 10 pp., 4 figs. Pretoria, 1927.

This information concerning *Cylas formicarius*, F. (sweet potato weevil) in South Africa has already been noticed from another source [*R.A.E.*, A, xv, 335]. The general conditions under which sweet

potatoes are grown are those usually recommended for the control of *C. formicarius* in other countries, and may therefore account for the fact that this weevil is not such a serious pest in South Africa as elsewhere. A brief note is also given on other insects observed boring in sweet potatoes, including an Aegeriid, *Tipulamima tricincta*, Le Cerf.

MOLESTINA O. (E.). **La Enfermedad de la Palma de Coco.** [The Disease of the Coconut Palm.]—*Bol. Subdirecc. t c. Agropecuaria del Litoral*, ii, no. 4, multigraph, pp. 1-3. Guayaquil, April-May 1927. [Recd. September 1927.]

Coconut palms on the coast of Ecuador are being destroyed by the palm weevil, *Rhynchophorus palmarum*. The measures advised are traps formed of pieces of palm-trunks and the mechanical removal of the adults and larvae. Poisons may be placed in the bore-holes, common salt having proved satisfactory for this purpose.

HEMPEL (A.). *Cerococcus parahybensis*, n. sp. **Nota preliminar.**—*Rev. Mus. Paul.*, xv, pt. 1, pp. 389-391. S. Paulo, 1927. (Also in English.)

This is the original description, dated 1921, of *Cerococcus parahybensis*, which infests coffee in Brazil [*R.A.E.*, A, xiii, 492].

PINTO DA FONSECA (J.). *Corthylus affinis* n. sp. (Col.).—*Rev. Mus. Paul.*, xv, pt. 1, pp. 585-590, 1 pl. S. Paulo, 1927.

The Scolytid infesting coffee in Brazil previously described as *Metacorthylus affinis* [*R.A.E.*, A, xiii, 616] is referred to the genus *Corthylus*.

URICH (F. W.) & HARDY (F.). **Progress Reports.**—*Trinidad & Tobago : Min. & Proc. Frog hopper Invest. Comm.*, pt. vii, pp. 181-183 & 188-191. Trinidad, 1927.

The incidence of the sugar-cane frog hopper [*Tomaspis saccharina*] in Trinidad in March and April 1927, with particular reference to the influence of weather conditions, is discussed. Experiments with ovicides show cyanogas calcium cyanide powder to be the most effective of those tried, from 70 to 100 per cent. of the eggs present being destroyed by it. A powder containing nicotine proved fairly effective, but the results with other materials were inconclusive.

BELTR N (E.). **Contribuci n al Estudio del *Coccobacillus acridiorum* d'H r.** [Contribution to the Study of *C. acridiorum*.]—*Mem. y Rev. Soc. cient. "Antonio Alzate,"* xlv, no. 3-6, pp. 129-153, 4 pls. Mexico, March-June 1926. [Recd. August 1927.]

The author's investigations in Mexico proved that *Coccobacillus acridiorum* occurs practically always in *Schistocerca paranensis*. It is pathogenic under certain conditions only, especially during rainy weather, natural spread of infection being very slow and unimportant. Fatal effects can be obtained by injection of cultures into the body of the locusts, but not by feeding them on plants sprayed with a culture, and the disease appears to be of no value for their control.

**Destructive Insect and Pest Act. Regulation no. 14 (Foreign) 3rd Revision.**—*Canada Dept. Agric.*, A.O.R., no. 8, supplmt. 2 pp. Ottawa, Ont., 11th August 1927.

This 3rd Revision, directed against the introduction of the oriental peach moth [*Cydia molesta*, Busck] and peach yellows, revises a previous one [*R.A.E.*, A, xv, 381] and came into force 11th August 1927. The provisions concerning the former prohibit the importation of fresh peaches and peach nursery stock into the Provinces of Ontario and British Columbia from all of the United States east of the Mississippi and St. Croix rivers. Fresh peaches and peach nursery stock from other States must be accompanied by a statement as to place of origin. The reshipping of peaches, originating in the prohibited States, into Ontario or British Columbia from other Provinces is prohibited.

GIBSON (A.). **What our Insects cost us.**—*Sci. Agric.*, vii, no. 11, pp. 440–445. Ottawa, Ont., July 1927.

This is a brief discussion of the damage caused by various important introduced and native insect pests in Canada, where the annual loss caused by insects is estimated to be at least £25,000,000, and of the federal organisation for their control. Estimates of the financial value of various investigations are also made.

PHILLIPS (W. J.). U.S. Bur. Ent. **Two New Species of *Harmolita* (Hymenoptera).**—*Proc. Ent. Soc. Wash.*, xxix, no. 5, pp. 125–129, 1 pl. Washington, D.C., May 1927.

*Harmolita elymophaga*, sp. n., has been reared from *Elymus* spp. in Washington; and *H. kingi*, sp. n., from *Hordeum jubatum* in Saskatchewan.

MCCOLLOCH (J. W.). **The Rôle of Insects in Soil Deterioration.**—*Jl. Amer. Soc. Agron.*, xviii, no. 2, pp. 143–150, 14 refs. Washington, D.C., February 1926. [Recd. July 1927.]

It has been stated that 95 per cent. of all insects invade the soil at some period in their life. The activities of some may be considered beneficial, since the soil is broken up by them and aeration is promoted, but even this, when excessive, may be detrimental to growing crops. Besides limiting crop production, directly or indirectly, insects may also cause deterioration of the soil by influencing crop rotations, and by limiting nitrogen fixation as a result of feeding on the root nodules of leguminous plants. The presence of insects in the soil may also necessitate the modification of cultural practices and the use of artificial fertilisers instead of barnyard manure, as the latter has a great attraction for many insects. The burrowing activities of insects may cause certain mechanical injuries, and the necessity for applying soil insecticides may have a deleterious effect on the physical, chemical and biological properties of the soil.

CLAYTON (E. E.). **Effect of early Spray and Dust Applications on later Incidence of Cucumber Wilt and Mosaic Diseases.**—*Phytopathology*, xvii, no. 7, pp. 473–481, 3 refs. Lancaster, Pa., July 1927.

The chief agency in the dissemination of the bacterial wilt and mosaic diseases of cucurbits in the United States is *Diabrotica vittata*, F. (striped cucumber beetle). Its control requires applications of dust or spray during the first six weeks after planting. It was found that if this beetle is controlled by a spray of Bordeaux mixture and lead arsenate, or by a dust of lead arsenate and lime or calcium arsenate and gypsum, bacterial wilt is also controlled. A Bordeaux spray (2 : 4 : 50) with 3 lb. lead arsenate and  $\frac{1}{2}$  U.S. gal. oil as a spreader to each 50 U.S. gals. proved distinctly better than a stronger mixture, and a dust of calcium arsenate and gypsum (1 : 15) was also very satisfactory.

WATSON (J. R.). **Report of the Entomologist.**—*Florida Agric. Expt. Sta. Rept. 1925–26*, pp. 42R–50R. Gainesville, Fla. [1926.] [Recd. May 1927.]

In 1926 the early spring growth of *Citrus* was much less damaged by *Aphis pomi*, DeG. (*spiraecola*, Patch) than during the two preceding seasons. Owing to the consistently low temperatures obtaining throughout the winter, the young trees remained dormant, and during December and January there was very little new growth on which the Aphids could feed. Growers had been urged to make a special effort to combat this pest during the winter, and the general adoption of this recommendation was probably a factor in reducing the injury [*R.A.E.*, A, xiv, 45]. A study of the amount of fruit on trees injured by Aphids showed that severe injury to early spring growth seriously reduces the quantity of fruit that the tree will set in the following year. It has been found that heavy rains kill many Aphids, sometimes all but those in tightly curled leaves being destroyed. The Chinese Coccinellid, *Leis* sp., liberated in a citrus grove in 1925, was recovered in 1926 [*loc. cit.*]. It hibernates during the greater part of the winter and will thus be able to survive the period when Aphids are scarce. In experiments on the control of this Aphid, a travelling hood was fitted over a power dusting machine to permit dusting to be done in a wind. This was found to be entirely practical for use with trees up to a height of 20 feet and enables trees to be dusted in a wind considerably stronger than the average during the spring Aphid season. The most promising insecticide used was finely ground tobacco, which adheres well when applied to wet foliage, and not only kills the Aphids on the foliage but acts as a repellent for a few days. This material is very much cheaper than dusts of nicotine sulphate and lime. The action of derrisol is much slower, and it may not penetrate curled leaves quite so well, but it seems to have a repellent effect for a day or two. Notes on the life-history of *A. pomi* have already been noticed [*R.A.E.*, A, xiv, 533]. It has been recorded from *Prunus* (*Laurocerasus*) *caroliniana* (cherry laurel) and early in May a few apple trees were very heavily infested.

It seems to make little difference whether the calcium cyanide used for the control of the root-knot Nematode [*Heterodera radicicola*, Greeff] is in the form of dust, granules or flakes, and the last two are more easy to handle. Apparently the fertilising value of calcium cyanide is less than that of the double treatment with sodium cyanide and ammonium sulphate. Although the adults of *Frankliniella tritici bispinosa*,

Morg. (Florida flower thrips) are generally found in flowers, where most of the feeding is done, the larvae were observed to be common on almost any tender succulent growth, especially the young shoots of cherry laurel.

Experiments on the control of *Empoasca fabae*, Harr. (bean leafhopper) consisted mainly of spraying or dusting the beans, using a hood of some sort that could be moved along the row [cf. *R.A.E.*, A, x, 532]. Dusting with 3 per cent. nicotine dust caused 80-90 per cent. of the leafhoppers to fall to the ground, but after a few minutes a great many of them were observed to revive and crawl back. With a 5 per cent. dust practically all leafhoppers, both nymphs and adults, fell to the ground and very few of them revived.

NEWELL (W.), GROSSMAN (E. F.) & CAMP (A. F.). **The Mexican Cotton Boll Weevil.**—*Florida Agric. Expt. Sta.*, Bull. 180, pp. 223-247, 4 pls., 3 figs. Gainesville, Fla., May 1926. [Recd. May 1927.]

The history of *Anthonomus grandis*, Boh. (Mexican boll weevil) is briefly outlined. It reached Florida in 1911 and had invaded the whole cotton growing area of this State by 1918. All stages of the insect are briefly described. The egg is deposited in a hole bored by the weevil in the wall of the square or boll, and the opening is sealed with a gum-like secretion. Squares and small bolls are shed as a result. Usually the egg hatches in about three days, though it may take two weeks or more during cool weather. The larva feeds on the surrounding tissue, its rate of growth being greatly affected by temperature, either cool or extremely hot weather delaying the process of development by several weeks. Though very few of the eggs fail to hatch, a relatively large percentage of the larvae fail to develop, direct sunshine on the squares, dry weather and lack of sufficient food causing the death of a large number. It is estimated that on an average about one-third of the number of squares in which eggs are laid produce adult weevils. Pupation takes place in the square or boll; about 4 days later the adults emerge and bore their way out through the wall, a process that occasionally takes several days. The adult weevil feeds on the squares, bolls and buds, and also to a slight extent on the leaves. After several days' feeding, oviposition begins and lasts for an average period of 35 days. The female lays an average of 175 eggs at the rate of 2-15 a day. The life-cycle from egg to egg occupies from 25 to 30 days. Hibernation seems to take place when the mean temperature is about 55° F.; the weevils shelter in woods or under rubbish in the fields and do not usually emerge until the temperature of their winter quarters has reached about 65° F. Under average weather conditions in Florida this occurs from early March to late June, the surviving weevils flying to the cotton plants and feeding on the buds and leaves until squares are available for oviposition. When food in the cotton field becomes scarce, the weevils tend to go in search of new material, and in Florida this usually takes place about 1st August. Ordinarily the weevil does not appear to fly far, but when migrating it may cover large distances. It is obvious that attempts to control the weevils when new ones are arriving daily will be almost useless, and early maturing varieties of cotton should therefore be used in order that a crop may be produced before migration takes place.

Climatic conditions are the most important factor in natural control, hot, dry summers being very destructive to the immature stages and

cold winters proving fatal to many of the hibernating larvae. In Florida the mild winters and wet summers favour the rapid increase of the weevils, and this can only be mitigated by removing possible hibernating places and planting varieties of cotton with sparse foliage that will permit the sun to shine through on to the soil to kill the immature stages in fallen squares. Weeds should be removed for the same reason. The advantages of an early and prolific variety of cotton are greatly enhanced by the proper use of fertilisers. Under these conditions the fruit sets before the weevils migrate, and the cotton can be picked and the plants destroyed early enough to force the weevils to enter hibernation in a starved condition.

Calcium arsenate containing not less than 40 per cent. arsenic pentoxide and not more than 0.75 per cent. water-soluble arsenic (a higher percentage causes scorching), with a density of not less than 80 or more than 100 cu. in. per lb., is the only dust recommended. Various types of dusting machinery are discussed. Applications may be made during the day, but the absence of wind at night enables the dust to settle evenly. The presence or absence of dew is not considered to be a factor favouring dusting at night.

Calcium arsenate dust is washed off by rain, and dusts mixed with adhesives have not been found so resistant to rain as syrup mixtures. Young plants may be easily and cheaply mopped with a mixture of 1 lb. calcium arsenate and 1 U.S. gal. water into which 1 U.S. gal. syrup is subsequently stirred [*cf.* *R.A.E.*, A, xii, 209].

Treatment may be applied early in the season in order to reduce the numbers of weevils emerging from hibernation sufficiently for a crop of cotton to set before enough weevils hatch in the field to do much damage; or the poison may be applied later to prevent serious injury from weevils hatching in the field. For poisoning early in the season dusting, mopping or the Florida method of control [*R.A.E.*, A, xi, 73; xii, 209] may be employed. If dusting or mopping is used, the first application should be made when the largest squares in the field are as big as peas (generally between 20th May and 1st June) and should be followed by 3-5 additional ones at intervals of 4-5 days until all the weevils have emerged from hibernation. Such applications may have to be continued until late June in heavily wooded localities where the weevils are slow in emerging. In districts where the woods are thin and dry and the soil is light almost all the weevils have emerged from hibernation by 5th June, and in these cases the Florida method may be found effective and has the additional value of completing the process of poisoning the weevils at one time. In certain districts where heavy clay soil is common the cotton does not produce any squares to strip by June 5th, and the weevils continue to emerge from hibernation after this date, the Florida method is not practicable, since it is not possible for bolls to set later than this and at the same time for the crop of bolls to be mature enough by the end of July to resist injury by the migrating weevils.

The procedure generally recommended for poisoning weevils hatching in the fields is the application of dust at intervals of 4 days until the weevils are under control (3 or more applications usually having to be made), beginning when 10 per cent. of the bolls are found to be punctured and repeating the treatment when the infestation again rises to 10 per cent. This method is not adapted to Florida conditions, for the following reasons. Owing to mild winters the spring emergence of weevils is heavy, and by the time that 10 per cent. infestation is reached there

are many fallen squares containing eggs and immature larvae, and numerous weevils laying eggs in the field. At the same time the summer rains have begun, and in some years rainfall is almost continuous throughout June and July, so that it is impossible to keep dust on the plants. Moreover, since migration takes place about 1st August, the crop must be mature by that date, and it is therefore impossible to delay weevil control while waiting for good weather.

In spite of early season poisoning, it is possible, under certain conditions, that a large number of weevils may develop in late June or early July before the crop is set, or when a heavy crop of cotton has been set and squaring becomes less rapid, they may become numerous enough to damage large numbers of bolls and so reduce the crop; in such cases dusting should be employed. If a good crop has been set early in the season, and it is only necessary to protect it beyond the point when it is susceptible to weevil attack, dusting need not be commenced until 20–30 per cent. of the squares have been punctured, but if the weevils begin to increase before a good crop has been set, dusting should be started at once. It is therefore obvious that the early poisoning should be done very thoroughly in order to reduce the amount of dusting that will have to be done later.

**TISDALE (W. B.) & KELLEY (J. G.). Stem Injury of Tobacco caused by Fungi growing on the Poison Mixture used for controlling Budworms.**—*Florida Agric. Expt. Sta.*, Bull. 182, pp. 279–286, 5 figs. Gainesville, Fla., May 1926. [Recd. May 1927.]

A mixture of 1 lb. lead arsenate and 75 lb. maize meal has been used successfully for the control of budworm [*Heliothis virescens*, F.] on shade grown tobacco in Florida for the last ten years [*R.A.E.*, A, vi, 213]. In 1925 and 1926 serious stem injury caused by fungi growing on the poison mixture was reported, an account of which is given in this paper. This disease has only occurred twice, and on each occasion about one week after a light rain terminating a long dry period, such conditions being favourable for the growth of the fungi on the damp mixture that has accumulated round the base of the stem during the period when there has been no rain to wash it away. Since these climatic conditions are unlikely to occur frequently, it seems probable that this type of injury will always be of minor importance.

**WATSON (J. R.). The Chinch Bug on St. Augustine Grass Lawns.**—*Florida Agric. Expt. Sta.*, Press Bull. 371, 2 pp. Gainesville, Fla., September 1925. [Recd. May 1927.]

In addition to calcium cyanide [*R.A.E.*, A, xv, 147], the following insecticides are recommended for use against the chinch bug [*Blissus leucopterus*, Say] on St. Augustine grass [*Stenotaphrum secundatum*] in Florida: a mixture of 93 lb. hydrated lime and 7½ lb. nicotine sulphate, which should be applied thickly enough to give the grass a whitish appearance; a dust containing finely ground tobacco dust with an equal weight of hydrated lime; and a solution of 1 U.S. pt. nicotine sulphate in 100 U.S. gals. water. The spread of the solution may be increased by the addition of 5–6 lb. soap or 1 lb. casein-lime.

WATSON (J. R.). **Mole-crickets.**—*Florida Agric. Expt. Sta.*, Press Bull. 372, 2 pp. Gainesville, Fla., September 1925. [Recd. May 1927.]

Three species of mole-cricket occur in Florida, the northern mole-cricket [*Gryllotalpa hexadactyla*, Perty], the short-winged mole-cricket [*Scapteriscus abbreviatus*, Scud.] and the changa [*Scapteriscus vicinus*, Scud.], which has been introduced from the West Indies. They are among the most destructive of market garden pests, eating the roots of plants as they make their shallow tunnels under the soil and coming to the surface at night to feed on the plants above ground. Bran baits poisoned with arsenicals and flavoured with citrus juice, such as are employed against grasshoppers, are quite effective against mole-crickets, and should be scattered over the land in the evening after sunset. Heavily infested gardens should be ploughed to break up the burrows and expose the insects to their enemies. Pigs are useful in destroying them and poultry should be allowed to follow the plough. After the ground has been cultivated for several days it should be rolled smooth, and the following morning the position of the mole-crickets will be indicated by the small piles of earth on the surface. A hole two or three inches deep should be made in each pile, half a tablespoonful of carbon bisulphide poured in and the soil quickly packed over the hole. A few fluid ounces of a solution made by dissolving 1 oz. sodium cyanide in 2 U.S. gals. water is as effective as the carbon bisulphide and cheaper. Fumigation of the soil with calcium cyanide is expensive and can only be recommended for particularly valuable gardens. The cyanide, which is placed at the bottom of the furrow at the foot of the plough, should be evenly distributed at the rate of 1,200 lb. to the acre. This treatment kills not only the mole-crickets but practically all other insect and animal life, including Nematodes [*Heterodera radicolica*, Greeff] causing root-knot in plants. It also renders the soil rich in nitrogen.

JAMES (C. B.) & WATSON (J. R.). **Spray Schedule for Peaches.**—*Florida Agric. Expt. Sta.*, Press Bull. 373, 2 pp. Gainesville, Fla., January 1926. [Recd. May 1927.]

In addition to a spray schedule for peaches in Florida, instructions are given for the preparation of self-boiled and dry-mix lime-sulphur sprays.

SNAPP (O. I.), ALDEN (C. H.) & OTHERS. **Experiments on the Control of Plum Curculio, Brown Rot, and Scab, attacking the Peach in Georgia.**—*U.S. Dept. Agric.*, Dept. Bull. 1482, 32 pp., 10 figs., 9 refs. Washington, D.C., April 1927. [Recd. July 1927.]

An account is given of experiments in spraying and dusting peaches conducted in Georgia during the years 1921–24, subsequent to a severe infestation by *Conotrachelus nenuphar*, Hbst., in 1920 [*R.A.E.*, A, x, 20; xi, 265, 412], which was estimated to have caused damage amounting to over £400,000, a figure augmented by the injury done by the brown rot fungus, *Sclerotinia fructicola*, which gained easy access to the fruit through the punctures made by the weevil. The relation of climatic conditions to the abundance of the weevil in Georgia during the course of the experiments is discussed. The measures previously employed [*R.A.E.*, A, viii, 276], which were based

on the supposition that *C. nenuphar* produced only one generation in the year, had proved inadequate owing to the fact that two generations frequently occur in Georgia when climatic conditions are favourable.

The sprays and dusts recommended as the result of this series of experiments are similar to those noticed from North Carolina [R.A.E., A, xi, 264] except that the first two applications of dust consist of 5 per cent. lead arsenate to 95 per cent. lime and that lead arsenate is omitted from the third spray. A schedule that combined dust and spray and provided for the application of dust after each rain until the peach stones hardened was more effective against the weevil than dust alone applied at specified times, but less effective than spray alone. An application of lead arsenate four weeks before the ripening of the fruit is indispensable where two generations of *C. nenuphar* occur.

DELCURTO (J. M.), HALSTEAD (E. W.) & HALSTEAD (H. F.). **The Citrus Industry in the Lower Rio Grande Valley of Texas.**—*Texas Dept. Agric.*, Bull. 79, 131 pp., 81 figs. Austin, Tex., January–February 1925. [Recd. July 1927.]

In the course of this bulletin on the cultivation of *Citrus* in Texas an account is given of the various insect pests likely to occur, their habits and their control. Measures are recommended against each pest, and a spray schedule for use in the Rio Grande Valley is appended.

SCHOLL (G. J.) & STEPHENS (J. C.). **Strawberry, Blackberry and Dewberry Culture in East Texas.**—*Texas Dept. Agric.*, Bull. 84, 31 pp., 11 figs. Austin, Tex., November–December 1925. [Recd. July 1927.]

In the course of this paper an account is given of the insect pests attacking these crops, with notes on their control. Besides the more common pests of strawberries, those dealt with include *Empria* (*Harpi-phorus*) *maculata*, Nort. (strawberry sawfly), *Trialeurodes* (*Aleurodes*) *packardii*, Morrill (strawberry whitefly), *Thrips tabaci*, Lind., and the Lygaeid, *Orithaea* (*Pamera*) *vincta*, Say. *O. vincta* may be controlled by sprays of miscible oil, kerosene emulsion or soap and nicotine. A dust consisting of 1 lb. unslaked lime, 3 lb. slaked lime or other inert powder such as kaolin, 4 U.S. fl. oz. 40 per cent. nicotine sulphate, and an equal volume of water is also effective against it, as well as against *T. tabaci*. The adults of *E. maculata* emerge 2 or 3 weeks before the plants are in full bloom. The eggs are laid under the epidermis of the leaves and hatch in about 2 weeks, the larvae feeding on the foliage. The plants may be completely defoliated, causing serious injury to the fruit crop as well as killing a number of the plants. When mature the larvae enter the soil for hibernation and pupate in the following spring. The remedial measures recommended are spraying with 1 lb. hellebore to 3 U.S. gals. water or with 2½ lb. lead arsenate to 50 U.S. gals. water, or dusting with pyrethrum. These insecticides should be applied when blooming begins, and applications may be continued until the berries are about one-third grown without any danger of poisoning them.

The adults of *T. packardii* occur at intervals from May to September, and lay their eggs on the lower surface of the leaves. The larvae hatch in about 10 days and feed on the leaves. The development from egg to adult usually occupies about 30–35 days, allowing three generations a year. The whiteflies are seldom sufficiently abundant to cause

serious injury, and the larvae and nymphs succumb easily to any insecticide of moderate strength. Fish-oil soap, 1 lb. to 6 U.S. gals. water, and oil emulsions have proved very effective. Plants from infested areas should be fumigated with hydrocyanic acid gas ( $\frac{3}{4}$  oz. sodium cyanide,  $\frac{1}{2}$  U.S. fl. oz. sulphuric acid, and 3 U.S. fl. oz. water to 100 cu. ft. space) for about 20 minutes.

The insect pests attacking blackberry and dewberry are *Agrilus ruficollis*, F. (red-necked raspberry cane borer), *Diastrophus turgidus*, Bassett (blackberry gall-maker), and *Pennisetia* (*Bembecia*) *marginata*, Harr. (blackberry crown borer). The only method of controlling these pests is by cutting out and burning the affected canes.

MCDONALD (R. E.). **Division of Entomology.**—*19th Ann. Rept. Com-miss. Agric. [Texas] 1925-26*, pp. 22-26. Austin, Tex., 1926. [Recd. July 1927.]

In cotton planted for the first time in 1925 in certain areas of Texas, 20 per cent. damage was caused by the pink bollworm [*Platyedra gossypiella*, Saund.], which showed an increase over previous years in other cotton-growing areas. Practically all the bollworms in bolls on stalks were killed by a fall of temperature to 8° F. in December, but many were found hibernating on the surface of the soil in dust-coloured silken cocoons, where no known method is effective in destroying them. Some doubt exists as to whether transport of infested material alone would account for all fresh infestations. If infestation is wind-borne, the bollworm is likely to spread from these potential new centres of heavy infestation to regions in the main cotton belt. Amendments in quarantine regulations rendered necessary by increased infestation require all lint produced in infested areas to be vacuum fumigated, and all seed to be sterilised at the gins as a continuous process, and afterwards to be crushed in the districts or carried back home by the farmers to be used locally. Strict inspection of gins, as a fertile source of infection, is being enforced.

A quarantine R.A.E., A, xiv, 628] has been promulgated against the mountain area of Arizona that should protect the adjacent cotton growing areas of Texas against the Thurberia weevil [*Anthonomus grandis thurberiae*, Pierce].

The sweet potato weevil [*Cylas formicarius*, L.] continues to spread over the State, infested potatoes and slips from Louisiana, a large area of which is under quarantine on account of heavy weevil infestation, being sold in Texas.

The cotton flea-hopper [*Psallus seriatus*, Reut.] caused considerable damage to the cotton crop and was followed by the leaf worm [*Alabama argillacea*, Hb.], against which treatment with proprietary arsenicals failed, probably owing to their containing insufficient arsenic.

SANBORN (C. E.), BROWN (W. J.) & BIEBERDORF (G. A.). **Entomology.**—*Bienn. Rept. Oklahoma Agric. Expt. Sta. 1924-1926*, pp. 38-43. Stillwater, Okla. [1927.]

Young cowpea plants are seriously injured by the melon aphid [*Aphis gossypii*, Glov.]. Cotton is not usually much injured by it after blossoming, as the Aphids are then attacked by predacious enemies; the activities of these are, however, considerably reduced by the application of arsenicals for the control of the boll weevil [*Anthonomus*

*grandis*, Boh.]. Cucurbits, especially water-melon, cantaloup melon and cucumber, are seriously injured by the Aphid, which not only attacks the vines but also ruins the flavour of the fruit, if the infestation is allowed to continue until the honeydew appears after the fruit has formed. Dusting with a mixture of 2-3 U.S. pts. of nicotine sulphate and 50 lb. hydrated lime is an effective measure.

The corn leaf aphid [*Aphis maidis*, Fitch] is a serious pest of broom corn. Practically all the varieties of broom corn grown at present contain anthracene characters, and it is suggested that the Aphid can only be successfully controlled by plant selection and the propagation of a variety without these characters.

The green bug [*Toxoptera graminum*, Rond.] usually appears in serious numbers about every seven years, and causes considerable damage to wheat and oats. Between the harvest and the sowing of the fresh crop the Aphids live on various grasses. There may be as many as 50 generations a year. The remedial measures recommended are a nicotine dust as used against *A. gossypii*, or burning the Aphids on the plants before the latter have reached the jointing stage. An oil burning device similar to a blow torch has given satisfactory results without causing severe damage to the plants.

For the control of the *Anthonomus grandis* cultural methods are considered to be superior to the use of insecticides under Oklahoma conditions [R.A.E., A, xiv, 138]. The cotton flea-hopper [*Psallus seriatus*, Reut.], though probably prevalent in Oklahoma for many years, was first recorded as a serious pest in 1926. The development in this State is no doubt similar to that in Texas, so that the measures recommended are the destruction of cotton plants and weeds on which the winter is passed in the egg stage [cf. R.A.E., A, xiv, 631].

SPULER (A.). **Codling Moth Traps.**—*Washington Agric. Expt. Sta.*, Bull. 214, 12 pp., 3 figs., 1 chart, 6 refs. Pullman, Wash., April 1927; also in *Better Fruit*, xxi, no. 12, pp. 9-10, 12-13. Portland, Oregon, June 1927.

During 1926, experiments were carried out to test the value of fermented apple juice as an attractant for the codling moth [*Cydia pomonella*, L.]. Owing to the value of traps in determining the dates for spraying, the preliminary results are described. The apple juice was prepared in various ways, but is apparently only attractive after fermentation has taken place. Brown sugar and yeast or pieces of rotten apple may be added to hasten this process. Cooked apple juice was no more attractive than raw cider made by crushing and pressing the apples. The different varieties of apples all gave similar results. The formula finally adopted was 1 U.S. gal. apple cider,  $\frac{1}{2}$  lb. brown sugar and 1 cake yeast. After fermentation has begun, the cider can be diluted with 4 U.S. gals. water. This bait is more attractive than vinegar [R.A.E., A, xiii, 125], and the cider may be made in the autumn and kept until the following spring. During these experiments it was found that the size of the opening of the container influenced to a large extent the effectiveness of the trap. The container should be deep enough to balance properly when suspended in the tree, and have an opening of 6-8 inches. It should be made of glass, granite-ware, etc., as the acid in the fruit dissolves iron in the container, some of which

combines with the tannin in the fruit and forms ink. When discoloured in this way the bait loses its attractant properties. A granite-ware bowl holding about a quart and having an opening 6 inches in diameter proved most effective. An average of 258 moths was caught in each of these bowls as compared with about 73 moths in each of the fruit jars (which had a smaller opening). The traps placed in the tops of the trees (which averaged 20–25 feet in height) caught 12·5 times as many as those placed near the ground and 5 times as many as those 12–15 feet above ground. If the traps cannot be placed in the top of the tree they should be hung in the upper third, and suspended by a string run through a screw eye so that they can be easily lowered when requiring attention.

During 1926 17,429 moths were caught in 93 traps in a six-acre orchard: over 15,000 of these were caught in 60 traps of the type described. About 60 per cent. of the moths were females, which is about the normal proportion of the sexes. Other insects caught were *Tortrix* (*Archips*) *argyrospila*, Wlk., and *T. (A.) rosaceana*, Harr., cutworm moths of various species, *Hyposopygia costalis*, F. (clover-hay moth) and *Chrysopa* sp. The traps used to determine the dates for spraying should not be placed near packing sheds from which the moths might be attracted to the baits. It is usually advisable to spray 10 days after the appearance of the moths in the traps.

BARTLETT (O. C.). **Report of the State Entomologist, July 1922–June 1925.**—*15th & 16th Repts. Arizona Commis. Agric. & Hortic.*, pp. 25–50, 5 pls. [Phoenix, Ariz., 1927.]

The work of the plant inspection service, which includes examination of road traffic and nurseries, is reviewed, and a list of pests intercepted during the period under review is given. The legal problems that prevented the maintenance of a non-cotton zone against *Anthonomus grandis thurberiae*, Pierce [*R.A.E.*, A, xi, 321] are discussed.

SKINNER (H. B.). **Report of the Date Palm Inspector for 1923 and 1924.**—*15th & 16th Repts. Arizona Commis. Agric. & Hortic.*, pp. 50–58, 3 pls. [Phoenix, Ariz., 1927.]

The work of eradicating *Parlatoria blanchardi*, Targ., from date palms [*Phoenix dactylifera*] in Arizona, begun in 1922, was continued in 1923 and 1924. Most infested palms were closely pruned and burned over with torches, but, owing to the fact that some palms succumbed to this treatment, valuable trees were simply pruned. Worthless palms were destroyed with coal oil, and palms and shoots in the vicinity of infested trees were fumigated for 45 minutes with hydrocyanic acid gas. The mite, *Paratetranychus heteronychus*, Ewing, which covers the green fruit, roughens the skin and finally causes the fruit to shrivel and drop, proved a rather serious pest in some localities, but can be controlled by a dust containing nicotine and sulphur. *Asarcopus palmarum*, Horv., found on imported palms, was effectively controlled with a nicotine spray. No serious damage seems to have resulted from the attacks of *Phoenicococcus marlatti*, Ckll., which was observed on imported palms throughout 1924.

O'DELL (J. H.). **Insect Pests prevalent during 1923 and 1924.**—*15th & 16th Repts. Arizona Commis. Agric. & Hortic.*, pp. 58–69, 3 pls. [Phoenix, Ariz., 1927.]

In addition to the more common insect pests occurring in Arizona during 1923 and 1924, this list includes: *Stictocephala festina*, Say (three-cornered alfalfa hopper), on lucerne; *Lygus* sp. (cotton-square dauber), *Dysdercus albidiventris*, Stål (south-western cotton stainer), *Anaphothrips arizonensis*, Morg., *Ulus crassus*, Lec., and *Myochrous longulus*, Lec., on cotton; *Chaetocnema ectypa*, Horn (desert corn flea-beetle), on maize; *Trichobaris mucorea*, Lec. (potato stalk-borer), on potatoes; *Harrisina brillians*, B. & McD. (grape leaf skeletoniser), and *Deilephila (Celerio) lineata*, F. (white-lined sphinx), on grape foliage; *Tibicen (Cicada) apache*, Davis, the egg punctures of which caused the twigs of *Citrus* to break off during heavy winds and which was also found on ash; *Cotinis texana*, Casey (*mutabilis*, G. & P.), destroying ripe peaches; *Leptoglossus phyllopus*, F. (leaf-footed plant bug), damaging the fruit of pomegranate; *Proleucoptera albella*, Chamb. (cottonwood leaf-miner), *Cotalpa lanigera*, L. (goldsmith beetle), *Prionoxystus robiniae* var. *nigra* (cottonwood borer), and *Pemphigus populitransversus*, Riley (poplar-stem gall aphid), on cottonwood [*Populus*]; *Chrysobothris femorata*, F. (flat-headed apple-tree borer), on rose bushes; and *Chionaspis etrusca*, Léon., which was attacked by *Chilocorus bivulnerus*, Muls. (twice-stabbed ladybird beetle), on tamarisk [*Tamarix*].

GARVER (H. L.). **The Stationary Spray Plant.**—*Washington Agric. Expt. Sta.*, Bull. 212, 42 pp., 20 figs. Pullman, Wash., February 1927. [Recd. July 1927.]

Various types of stationary spraying plants are discussed [*cf. R.A.E.*, A, xv, 182].

STREETER (L. R.). **Physical Properties of Commercial Dusting and Spraying Materials.**—*N. Y. State Agric. Expt. Sta.*, Tech. Bull. 125, 12 pp., 11 refs. Geneva, N.Y., April 1927. [Recd. July 1927.]

Insect control by means of spraying and dusting can only be secured by complete adhesiveness and thorough covering of the foliage. A review is given of some previous work on the physical properties of dusting and spraying materials [*R.A.E.*, A, xi, 551, etc.]. Although the covering quality and adhesiveness of a dust or spray material is increased with the fineness of particle size, there being no limit to the degree of fineness desirable in material used as spray, it is possible for powder intended for dusting purposes to be so buoyant in air as to make it impracticable for use.

Screening tests for measuring the size of particles of arsenicals and sulphur dusts have hitherto been unreliable and unsatisfactory on account of packing and sticking in the sieves, which is largely due to frictional electricity. When mixed with lead arsenate, sulphur dust, which otherwise becomes electrified in the process of screening, passes through the sieves free from electrical excitation. Results of screening tests on commercial samples of materials prepared for dusting and spraying purposes are given. Lead arsenates, 70 to 90 per cent. of which failed to pass through a 200 mesh sieve, were screened through a

325 mesh sieve without difficulty when mixed with sulphur at the rate of 6 gm. lead arsenate to 36 gm. sulphur. Sieve analyses of sulphur dusts became more accurate when the sulphur was thus freed of the electric charge caused by friction. Percentages of materials other than lead arsenate passed through the 325 mesh sieve were increased by mixing with sulphur : from 14 to 96.2 per cent. for calcium arsenate, from 20 to 99.5 per cent. for kaolin and from 14.3 to 99.2 per cent. for slate dust. Equal parts of sulphur and bentonite were required to produce an electrically neutral dust, while the other materials could be screened without difficulty when mixed in a proportion of 1 part to 6 of sulphur. Zinc arsenate and Paris green were found to retain a charge after screening, and attempts to neutralise these powders with sulphur failed.

Screening tests proved sufficiently accurate for particles of tobacco fibres, which were coarser than the other dusts, but a smaller particle size than that submitted to test is desirable for dusting purposes.

Experiments were made with gelatine solution to determine the suspension qualities of different brands of lead arsenate ; this method, which is described, can be used to compare arsenicals and detect products with inferior physical properties, but gives no information on the actual size of the particles. The poor suspension properties of some samples of which the chemical composition was good would account for their failure to control insect pests, as they would not cover the foliage adequately. In general a high dry volume figure (density in cu. ins. per lb.) indicates good suspension properties in lead arsenate.

ALLEN (F. W.). **Apple Growing in California.**—*California Agric. Expt. Sta.*, Bull. 425, 54 pp., 7 figs., 4 pls., 21 refs. Berkeley, Cal., May 1927.

In the course of this bulletin on the cultivation and marketing of apples a short chapter is devoted to the more important insect pests of this crop in California and their control, and a spray programme is also given.

OVERHOLSER (E. L.). **Apple Pollination Studies in California.**—*California Agric. Expt. Sta.*, Bull. 426, 17 pp., 21 refs. Berkeley, Cal., May 1927.

Experiments are described showing that the use of bees as a means of pollinating apples in California greatly increases the set of fruit. Cross-pollination increases the set of fruit even with self-pollinating varieties. The effects of self-pollination and cross-pollination on various varieties are discussed.

CALDIS (P. D.). **Etiology and Transmission of Endosepsis (Internal Rot) of the Fruit of the Fig.**—*Hilgardia*, ii, no. 7, pp. 287-328, 3 figs., 16 pls., 48 refs. Berkeley, Cal., January 1927. [Recd. July 1927.]

This is a detailed account of the fungus, *Fusarium moniliforme* var. *fici*, n., causing internal rot of figs. It is transmitted as a result of the spores being carried on the body of *Blastophaga psenes*, L. [R.A.E., A, xiv, 61].

DE ONG (E. R.), KNIGHT (H.) & CHAMBERLIN (J. C.). **A Preliminary Study of Petroleum Oil as an Insecticide for Citrus Trees.**—*Hilgardia*, ii, no. 9, pp. 351–384, 4 figs., 15 refs. Berkeley, Cal., January 1927.

A detailed account is given of experiments on the effects of petroleum oils as sprays for *Citrus*, particularly against *Chrysomphalus aurantii*, Mask. (red scale). Most of the conclusions drawn from these studies have already been noticed from shorter papers [*R.A.E.*, A, xiii, 343; xiv, 650].

A short series of experiments have also been made with coconut-oil fatty acids, the formula recommended against Aphids [*R.A.E.*, A, xiii, 183] being modified in various ways. When the amount of glue was reduced so as to make an emulsion of the quick-breaking type containing 1 or 2 per cent. fatty acid when diluted, the plants and fruit were seriously injured, and the Coccids were not controlled. A 2 per cent. emulsion without the gasoline killed all but 0.66 of the Coccids, but also caused serious injury to the fruit and plants. The stock emulsion made according to the original formula diluted to contain 2 per cent. of fatty acid (80 times as strong as recommended for Aphids) was not injurious to the plants but had no apparent effect on the Coccids, confirming the conclusions previously reached regarding the necessity of a quick-breaking emulsion in order to liberate the insecticidal agent for effective use.

HAYES (W. P.). **The Immature Stages and Larval Anatomy of *Anomala kansana* H. & McC. (Scarabaeidae, Coleop.).**—*Ann. Ent. Soc. Amer.*, xx, no. 2, pp. 193–206, 3 pls., 6 refs. Columbus, Ohio, June 1927.

The early stages of *Anomala kansana*, H. & McC. [*R.A.E.*, A, xii, 583] are described in the hope that in time sufficiently reliable characters may be found to enable the various Scarabaeoid larvae to be identified.

LANGSTON (J. M.). **A New Species of *Phyllophaga* from Mississippi.**—*Ann. Ent. Soc. Amer.*, xx, no. 2, pp. 221–223, 1 fig. Columbus, Ohio, June 1927.

*Lachnosterna* (*Phyllophaga*) *davisi*, sp. n., is described from Mississippi.

KNOWLTON (G. F.). **A New Rabbit Brush Aphid from Utah.**—*Ann. Ent. Soc. Amer.*, xx, no. 2, pp. 229–231, 1 fig. Columbus, Ohio, June 1927.

An Aphid of the subfamily APHIDINAE, *Durocapillata utahensis*, gen. et sp. n., did considerable damage to rabbit brush (*Chrysothamnus viscidiflorus*) in Utah. The injury causes the twisting and stunting of the ends of the twigs, the curling of the leaves, and the stunting of the flower heads and their supporting stems. Heavily infested bushes may succumb in early autumn.

HINDS (W. E.). **Notes on the Biology and Habits of the Peruvian Cotton Square Weevil** (*Anthonomus vestitus* Bohm.).—*Ann. Ent. Soc. Amer.*, xx, no. 2, pp. 251–254. Columbus, Ohio, June 1927.

*Anthonomus vestitus*, Boh. (Peruvian cotton square weevil) has a much lower reproductive capacity than *A. grandis*, Boh., with which its habits are compared, and it is believed to be a very much less serious pest than the latter. The observations described were made in the field and the laboratory in the cotton-growing valleys of Peru in 1926. In observations on a limited number of individuals at an average temperature of 79° F., the egg stage lasted 66–72 hours, the larval stage 8–9 days, and the pupal 3–6 days, followed by a period of 2–3 days before the adult emerged, so that the total life-cycle from oviposition to the emergence of the adult was 15–20 days.

In the Canete Valley *A. vestitus* was found to be common in practically all fields, being active from January, the beginning of the squaring season, to the end of the growing season, and frequently causing considerable damage. The bolls are seldom attacked for feeding or oviposition, a great preference being shown for young squares, those with a diameter of about  $\frac{1}{4}$  in. being usually attacked. The reason for this appears to be that the snout of the weevil is too short to penetrate the floral envelope and enable it to feed on the pollen sacs in squares with a diameter of more than  $\frac{7}{16}$  in. *A. vestitus* shows the same dependence on pollen as food necessary for normal egg production as does *A. grandis*. The preoviposition period of feeding of the adult may vary from 24 hours, where the female has access to a cut-open square, to 6 days where there is difficulty in securing pollen. The eggs are placed almost invariably in the upper part of the constricted basal portion of the square. The larvae gradually work their way into the pollen sac, where most of the later feeding occurs. The infested squares fall to the ground after 5–6 days, and most of the larval development occurs after the square has fallen.

CUTRIGHT (C. R.). **Notes on the Computing of Mean Temperatures for Biological Use.**—*Ann. Ent. Soc. Amer.*, xx, no. 2, pp. 255–261, 1 chart, 6 refs. Columbus, Ohio, June 1927.

Various methods of computing mean temperatures are discussed and compared, including a new method based on the use of a planimeter. The most accurate method is the calculation of the mean from 24 daily (hourly) readings, the mean of 12 daily readings being for most purposes practically as accurate. The planimeter method is not quite so accurate for periods as short as a day, but because of its great saving in time and labour its use is recommended, especially in instances where a mean temperature is desired for periods covering several days or a week. Two different ways of using this method are described.

BATCHELDER (C. H.). **The Variability of *Aphis gossypii*.**—*Ann. Ent. Soc. Amer.*, xx, no. 2, pp. 263–278, 6 figs. Columbus, Ohio, June 1927.

As there has been considerable confusion in literature concerning the identity of *Aphis gossypii*, Glov., the possible range of variation is here dealt with, as studied from individuals bred from various food-plants under controlled conditions.

RANKIN (W. H.). **Mosaic of Raspberries.**—*New York State Agric. Expt. Sta.*, Bull. 543, 60 pp., 8 pls., 17 refs. Geneva, N.Y., March 1927. [Recd. July 1927.]

The raspberry-growing industry, which is of great importance in New York State, is very much affected by the presence of virus diseases, of which mosaic is by far the most serious. The susceptibility of different varieties of raspberries to mosaic is discussed, and the varieties are classified according to their degree of susceptibility and "klen-ductivity." The latter term is used to signify "disease-escaping;" it has been found that some varieties remain free from infection under conditions conducive to high percentages of infection in other varieties, and that these varieties are not necessarily immune from or even resistant to infection. Klenductivity is apparently due to an external relation between the variety and the infective stage of the Aphid vector, such as the hairiness of the cane and leaves, while resistance and susceptibility are determined by the internal relation between the cell contents and the virus. The disease is transmitted by *Aphis rubiphila*, Patch (small raspberry aphid) and *Amphorophora rubi*, Kalt. (large raspberry aphid) [*R.A.E.*, A, x, 459; xv, 283]. *Aphis rubiphila* apparently causes no direct injury to the raspberry and is so sluggish in habit that mosaic is spread very slowly by it and is easily controlled by roguing. The eggs are laid in the axils of the leaves near the tips of the canes, and the stem-mothers hatch when the buds begin to show green. On warm days they feed on the outer surface of the folded leaves. Within a week or two most of them descend to laterals nearer the ground or to new suckers just coming up. The stem-mothers are mature and the first generation young are present when the laterals are 2 or 3 inches long. The Aphids of the first generation, and usually of the second and third also, are very abundant and feed on the young suckers in June, but rarely thrive on the fruiting laterals. Under cages and in the greenhouse winged forms develop, at least in the first generation. In Canada winged forms are very unusual in the open, but they are occasionally found in New York. It is doubtful if they would contribute to the spread of mosaic much more effectively than wingless forms except that when dislodged they may alight at greater distances. During the hot summer months *A. rubiphila* generally becomes very scarce. The summer generations feed on the veins on the lower surface of the leaves, and the later and more active generations often feed on the new suckers that come up in the autumn. Cultivation at this time, when young suckers are abundant between the rows, undoubtedly assists in scattering the Aphids that are on diseased plants. Young of new generations are constantly produced, even as late as October. Sexual forms without wings appear about November, and numbers of eggs are laid near the tips of canes, many of which are pruned off before the eggs hatch. This Aphid seems to be uncommon on blackberries. During the period of greatest activity of the Aphids in June, new suckers affected by mosaic seem to be more favourable for feeding than healthy ones.

*Amphorophora rubi* produces winged forms in abundance in several generations in late spring and thrives under unfavourable conditions better than *Aphis rubiphila*, probably owing to its greater activity in seeking the best feeding places. The eggs are laid on the new canes and hatch about mid-April, or when the laterals are 1 or 2 inches long and the first and second leaves are beginning to unfold. The stem-mothers hatching from these eggs mature when the laterals are nearly

3 inches long, and both stem-mothers and young of the first generation are found while the laterals are from 4 to 12 inches long. They then crawl up and down the laterals and new suckers and eventually scatter as individuals and appear sometimes on new suckers up to 3 feet away from the row. By June, the first generation is mature and winged forms are not uncommon, but these are no more active than the wingless forms and generally stay on the leaves. The Aphids diminish in numbers during July and in August are difficult to find. It is possible that there is an alternate autumn food-plant, but the evidence is rather against this. The sexual forms and oviposition of the species have not been observed. In the Hudson River Valley, *A. rubi* becomes abundant much later than in the Geneva region (generally during August).

Other species of Aphids that are general feeders may occasionally be found on raspberries, but are of no importance in the spread of mosaic. Two other species of *Amphorophora*, *A. rubicola*, Oestl., and *A. sensoriata*, Mason, are commonly found on raspberry in the eastern United States; and where these are prevalent it is quite possible that they may serve as vectors of mosaic. Keys are given to the alate and apterous viviparous females of these two species and *A. rubi*. *A. rubi* is easily knocked to the ground by heavy rain and will rapidly travel several feet in search of a new food-plant or may be blown a much greater distance. Continuous rain, however, frequently destroys many before they can reach a fresh food-plant. When a non-lethal fumigant is used, all the Aphids disappear immediately, but two days later they are as abundant as ever on the tips of tall suckers.

A good deal can be done towards the reduction of mosaic disease by the use of mosaic-free stock, the isolation of new plantings, and roguing. Another method of control would be by elimination of the Aphid population. The relative value and expense of these methods are discussed. Experiments with insecticides against *Amphorophora rubi* indicated that a spray consisting of 8 lb. fish-oil soap, 1 U.S. pt. nicotine sulphate and 100 U.S. gals. water was more effective than a dust containing 2 per cent. nicotine sulphate, but the Aphid population was not materially reduced for long by either material, and these methods are expensive compared with cultural ones. Preliminary tests with Cyanogas calcium cyanide "A" dust [*R.A.E.*, A, xiv, 74] indicated a high killing efficiency against *A. rubi*, but when it was used at a dosage sufficient to kill 90 per cent. of the Aphids severe injury to the plants resulted. In the Hudson River Valley, where several insecticides were tried, 2 and 3 per cent. nicotine dusts practically eliminated *A. rubiphila* without injuring the plants, but had little lasting effect on *A. rubi*, and sprays of 1 or 2 per cent. white neutral oil emulsified in water with casein-lime did not injure the plants, but failed to kill all the adults of *A. rubi*.

The symptoms of mosaic in black raspberries [*Rubus occidentalis*] are somewhat different from those in red raspberries [*R. strigosus*] and purple raspberries [*R. strigosus*  $\times$  *occidentalis*], but the author is of the opinion that the various symptoms observed in black raspberries, which have been ascribed to three distinct diseases (mosaic, leaf-curl, and streak or eastern blue-stem), are all produced by the virus of red raspberry mosaic. Black raspberries are generally more susceptible to mosaic than red raspberries, and plants infected in early summer often fail to survive the following winter. The rate of spread of mosaic from red to black raspberries differs greatly with the varieties

of the latter ; most of them do not exhibit symptoms for the first two years after planting. Mosaic has not been definitely determined in blackberries or dewberries growing between rows of affected red raspberries at Geneva, so that it would appear that they are either immune or klendusic.

The selection of varieties of raspberries resistant to mosaic may do much to solve the problem of loss from the disease. The nursery law of New York requires that all raspberry stock offered for sale shall originate from fields inspected and rogued for mosaic and other virus diseases. Plantings of mosaic-free stock should not be made within 200 or 300 feet of other raspberries. All roguing and cultivation operations should be done with a view to disturbing any Aphids present as little as possible. Fewer Aphids are dislodged in this way when the solid-row system is used than under the hill system, especially when the rows are spaced 8 or 9 feet apart.

The condition in raspberries known as "mild mosaic," which, although widespread, is of little economic importance, is believed to be caused by the feeding of *Paratetranychus pilosus*, C. & F. (European red mite) on the unfolding leaves. The injury consists of light green areas that persist throughout the season, and is distinct from that caused by attacks of *P. pilosus* on fully expanded leaves. The most significant observations indicating that "mild mosaic" is not a virus disease are that the most vigorous plants show the most pronounced symptoms, that the injury is confined to a few leaves of the same age on all the canes, that the plants never show other injurious effects over a period of years, that more pronounced symptoms do not follow in successive seasons, and that plants affected in one season may not be so in the next.

SEVERIN (H. C.). **Department of Entomology-Zoology.**—*Ann. Rept. S. Dakota Agric. Expt. Sta. 1925-26*, pp. 19-22. Brookings, S.D. [n.d.] [Recd. August 1927.]

An account of the natural enemies of *Gryllus assimilis*, F. (black field-cricket) and the measures adopted for its control is taken from a paper noticed previously [*R.A.E.*, A, xiv, 284].

*Aegeria* (*Synanthedon*) *pictipes*, G. & R. (plum tree borer) is a serious pest of wild and cultivated plum trees in South Dakota, and in the eastern half of the State it also attacks cherry. The larvae of this moth feed on the inner bark, usually in the trunk and larger limbs and well above the ground level, their presence being indicated by a flow of sap mixed with excrement and small pieces of wood. The increase of a wounded area by feeding of the larvae sometimes results in the girdling of the trunk or limb.

The larva hibernates in a cell just under the bark, constructs a cocoon and pupates about the first week of May. The pupa penetrates the bark about 1st June, after which the adults emerge and mate from two to five days later. Oviposition follows immediately, the eggs being laid in cracks or wounded areas. Dissections indicate that an average of 225 eggs may be laid by each female, though the actual average under normal conditions is probably less. The eggs hatch in 8-10 days, the larvae piercing the outer bark, beneath which they establish themselves and feed throughout the year until hibernation begins with the cold weather. The data available indicate that the insect is single-brooded. Natural enemies of *A. pictipes* include a

species of *Microbracon* and ants, both of which attack the larvae, and birds and a fungus, which attack both larvae and pupae. Experiments are about to be made in the control of the insect by painting infested trees with paradichlorobenzene dissolved in liquid paraffin, and horticultural practices that tend to eliminate imperfections of bark likely to afford an entrance to the insect are recommended.

CHANDLER (S. C.). **Life History Studies of the Peach Borer in Southern Illinois.**—*Trans. Illinois State Acad. Sci.*, xix, pp. 191–194, 1 pl., 2 charts. Springfield, Ill., 1926. [Recd. August 1927.]

Paradichlorobenzene is most effective for the control of the peach tree borer [*Aegeria exitiosa*, Say] if applied in the autumn when the soil temperature is 60° F. or above. If it is applied too late, volatilisation is too slow, and if it is applied too early the late hatching larvae escape treatment. It should therefore be used as soon as possible after all the larvae have hatched. During 1924 and 1925 cone-shaped screen wire cages (about 1 ft. high and 2½ ft. in diameter) were placed around the base of the tree to ascertain the emergence of the moths, so that the earliest dates for effective treatment against the resulting larvae could be determined. The cages were examined every 2–3 days from July to October. The earliest and maximum emergence occurred a fortnight earlier in 1925 than in 1924, apparently depending to some extent on temperature conditions. Each rise in temperature is followed about 2 weeks later by an increase in the number of moths emerging, and each drop in temperature by a corresponding decrease. The hatching period also varies according to temperature; observations in New Jersey have shown that about 15 days are required for incubation in September and October. It may, therefore, be concluded that the last eggs hatch about 15 days after the last emergence of the moths.

MOORE (H. C.). **Results of Potato Spraying and Dusting Experiments, 1926.**—*Qtrly. Bull. Michigan Agric. Expt. Sta.*, ix, no. 4, pp. 131–133. East Lansing, Mich., May 1927.

An experiment was conducted to compare the effectiveness of dusts and sprays as repellents for leafhoppers [*Empoasca fabae*] and in controlling fungus diseases attacking potatoes. Five applications each of a dust containing 25 per cent. dehydrated copper sulphate and 75 per cent. hydrated lime, and a 4–4–50 Bordeaux mixture, were made between mid-July and mid-September at intervals of about 10 days on three plots for each treatment. An increase of leafhoppers of over 100 per cent. between 17th August and 17th September occurred in 4 plots left untreated as checks, as compared with practically no increase on the treated plots; and the increased yield in the latter amounted to 64·4 per cent. in the case of the spray and 46·7 per cent. in the case of the dust.

The cost of materials and labour in experiments carried out in another district under similar conditions amounted to about 50 per cent. more for dusting than for spraying, although the labour cost of the latter is more than twice as much. The increased yields in the second series of experiments amounted to 10·09 per cent. in the case of the spray and 5·48 per cent. in the case of the dust.

PETTIT (R. H.). **Mutilation of Twigs and Canes, due to the Deposition of Eggs by three common Insects.**—*Qtrly. Bull. Michigan Agric. Expt. Sta.*, ix, no. 4, pp.157-160, 5 figs. East Lansing, Mich., May 1927.

Insects that mutilate twigs and canes by the deposition of eggs, and when concentrated in certain areas in Michigan cause injury to new stock, include tree-crickets [*Oecanthus*], which oviposit in new growths of raspberry, blackberry, grape, peach and other plants with large pith cavities and relatively thin shells; and the buffalo tree-hopper, *Ceresa bubalus*, F., and an allied tree-hopper, *Stictocephala inermis*, F., both of which deform and sometimes kill twigs of apple and other trees and shrubs, laying their eggs in curved paired slits, in groups of 5 or 6, so that they are embedded in the twig. The nature of the injury is described in each case.

As the tree-crickets feed largely on Aphids, and split or mutilated sections of cane can be cut out and burned, it is possible that the good done by them may compensate for the injury. Well-established trees seldom suffer permanent damage from the tree-hoppers, the eggs of which are laid in late summer and early autumn, but young nursery stock planted out in fields of lucerne or other herbaceous food-plants of the insects may suffer the loss of branches and twigs and consequent stunting of growth. *S. inermis* is less common than *C. bubalus*; the lesions resulting from egg deposition of the former insect are more angular and often accompanied by cracking and curling back of the bark.

HEALD (F. D.), NELLER (J. R.), OVERLEY (F. L.) & DANA (H. J.). **Arsenical Spray Residue and its Removal from Apples.**—*Washington Agric. Expt. Sta.*, Bull. 213, 56 pp., 19 figs. Pullman, Wash., March 1927. [Recd. July 1927.]

Many experiments have been conducted in Washington and various machines devised for the treatment of apples bearing a residue of arsenical spray that is beyond the amount tolerated in international trade (0.01 grains arsenic per lb. fruit). Various methods of dry wiping of the fruit are described, but these are only successful when the residue present is only slightly above the tolerated amount, and the process may have some effect on the storage properties of the fruit. More complicated machines for wet cleaning of the fruit are explained and illustrated. Spraying with water, with or without a solvent, previous to harvesting has not proved successful, nor was the arsenic removed by a driving spray of water supplemented by the action of a brush wiper. Soaking apples for 10 minutes in a solution of 1 per cent. (by volume) of hydrochloric acid followed by rinsing in water removes the residue successfully, but is both lengthy and expensive. Machines that give promising results include one consisting of a pair of cylindrical revolving brushes working in a vat of the acid solution; an overhanging perforated pipe that forces a spray of acid on to the apples as they are carried forward over spiral rollers; and a similar device with the spray from clipper nozzles. These rapid methods have not given uniformly good results with all lots of fruit, but some lots carrying over seven times the tolerated amount of arsenic have had the amount reduced to less than 0.01 grains per lb. After these treatments the apples were rinsed in water and then dried, preferably with a brush wiper. It has

been clearly proved that the pressure spray system is better than the wet brush process, but it is not known how long the machines as at present devised will stand commercial operation on a large scale. The use of an oil spray apparently renders the removal of arsenical residue by the acid process more difficult. The effect of these treatments on apples in storage is discussed, though they have not been used in practice sufficiently for the full results to be determined. There has been no increase of rotting during the short time that treated apples have as yet been in store.

WOGLUM (R. S.), LA FOLLETTE (J. R.) & LANDON (W. E.). **Handbook of Citrus Insect Control for 1927.**—*California Fruit Growers' Exchange*, Bull. 4, 33 pp. Los Angeles, Cal., July 1927.

In this bulletin the values of the different insecticides, including various proprietary oil sprays, used commercially on *Citrus* in California during the season 1926–27 are compared, due consideration being given to tree injury as well as to scale mortality. Where a single fumigation has given control in past years, a continuation of this treatment is advocated, otherwise for orchards heavily infested with the resistant type of black scale [*Saissetia oleae*, Bern.], early fumigation followed by a proprietary oil spray (Triumph) with lime-sulphur between 15th October and 15th January is recommended. The fumigation should be started as soon as practically all the eggs have hatched and the old scale is loosened, preferably in late July or August, though late hatching may delay it until September. On oranges the spray treatment should be completed by January, and on lemons or vigorous small oranges on which the scale develops rapidly, by the middle of November; the risk of injury is too great when this oil is used in late winter or during spring and summer. In autumn, spraying should not be carried out during hot, dry winds or at temperatures above 90° F. It was found that this combination treatment properly applied not only practically ensured commercial control of *S. oleae*, but also controlled the red scale [*Chrysomphalus aurantii*, Mask.] and freed the orchards from red spider [*Tetranychus citri*, McGregor] without apparent effect on crop production. A double treatment with oil sprays did not give as satisfactory control of *S. oleae* in the tops of the trees; it could not be depended on to kill *C. aurantii*; and it injured the trees too severely to be recommended. Where the infestation is light and there is no material risk of injury from smut, a single application of Triumph oil and lime-sulphur after 15th October is recommended. Where there is a risk of injury from smut if treatment is delayed until late autumn, a suitable oil spray should be used in summer, preferably late July or August. For single applications the five proprietary oils used most extensively proved considerably more effective than fumigation. In the case of lemons, the fruit should be picked prior to spraying, and, if possible, an interval of six weeks should be allowed to elapse before it is picked again, as the spray may retard colouration. In areas where *S. oleae* is less resistant and *C. aurantii* or citricola scale [*Coccus pseudomagnoliarum*, Kuw.] is also present, fumigation should be used in preference to oil sprays. This treatment should also be used in districts where *S. oleae* is of the non-resistant type and occurs alone or in association with the purple scale [*Lepidosaphes beckii*, Newm.].

Sprays are not entirely satisfactory for the control of *Chrysomphalus aurantii*, but where this scale need not be considered, oil sprays are recommended for the control of other scales and *T. citri*. On lemons the recommendations for the control of the resistant type of *C. aurantii* are substantially the same as those suggested for the previous season [R.A.E., A, xiv, 493], namely, a heavy oil spray in August-September followed within ten days by fumigation. It appears that treatment after the middle of August is most effective in controlling *T. citri* for the entire year, so that the combination treatment should be delayed until after this time if *T. citri* is also present. Red scale mortality is usually lowest on the outside lemons, particularly those that come into contact with the tent, and an experiment indicates that in some orchards the removal of such fruits within 2-3 weeks after fumigation might retard reinfestation. In heavily infested orange orchards where a single fumigation is not effective, alternative measures are a fumigation in August followed by a winter fumigation, preferably in January or February, with a slightly heavier dosage, or a light oil spray applied in August followed immediately by fumigation. Fumigation is exclusively recommended for *C. aurantii* in areas where it is of the non-resistant type. It is also recommended for control of *L. beckii* except in cases where infestation is heavy and the necessary dosage likely to cause injury to the tree, when a light oil spray should be followed by fumigation within ten days in August or September.

Normally a fumigation in July or August will control *Coccus pseudomagnoliarum* for 2-3 years. Where the citrus thrips [*Scirtothrips citri*, Moul.] is also present, a light infestation of the scale may be controlled by a light oil spray with lime-sulphur applied in May. The same spray at a slightly higher concentration should also be applied from October to January if the scale infestation is not discovered until late autumn when it is too late for fumigation. A lime-sulphur spray applied during the first part of May is recommended for *S. citri*.

If a treatment for *T. citri* alone is necessary, an oil spray applied in September will give control through the season of greatest damage, i.e., middle of September to April. It is possible that light oils could be used even in late autumn without damage to fruit, but heavy oils should be avoided. For oranges low dosages of the lighter oils should be used in late summer or early autumn, and the treatment completed before October to avoid injury to the fruit and trees. A nicotine sulphate and lime-sulphur spray is recommended against the citrus aphid [*Aphis pomi*, DeG.], which causes most damage to the early spring growth of orange trees in the coastal districts, since it will also reduce light infestations of *T. citri*.

The injury caused by fumigation and oil spraying during the 1926 season is discussed, and in this connection suggestions are made regarding the use of the various oil sprays. A comparison of orchards fumigated with calcium cyanide dust (Citrofume) and liquid hydrocyanic acid showed that 1 oz. 30 per cent. dust and 16 cc. liquid HCN give practically equivalent scale mortality. It was suggested that heavy rot and drop of oranges occurring in February 1926 might have been due to oil spraying, but observations showed that the ultimate loss was approximately the same in fumigated and sprayed orchards; orchards sprayed with Triumph oil and lime-sulphur showed less injury than the others.

DUTTON (W. C.). **Some Effects of Oil Sprays.**—*Canad. Hortic., Fruit and Truck* edn., 1, no. 7, pp. 168 & 176. Peterboro, Ont., July 1927.

Tests to ascertain the effect of oil sprays on the breaking of the rest period and on the bud development of pear and peach trees in Michigan are described. Applications of several materials were made early in November, and 12 days later shoots and branches of treated and untreated trees were cut and placed in water in the greenhouse, where the temperature was such that growth would begin if the rest period had been broken. Untreated shoots and those sprayed with lime-sulphur were still inactive three weeks after cutting, whereas rapid development of fruit-buds on peach and leaf-buds on pear occurred on shoots treated with soluble sulphur (there were no fruit-buds on the pear wood). Treatment with two proprietary miscible oils caused growth of the peach shoots to be active, while the pear shoots showed little indication of growth, most of the buds being found to be killed. No growth developed at any time on these shoots in the greenhouse, but the injury developed to a greater extent there than in shoots left on the tree. After 30 days many of the blossoms were open on the peach shoots sprayed with soluble sulphur, but in the oil-treated shoots so much injury had developed that growth had stopped, the unsprayed shoots and those sprayed with lime-sulphur still remaining inactive. One variety of peach showed active growth regardless of treatment, indicating that its rest period had been previously broken by natural agencies. Examination of treated peach trees in the field showed from 55 to 84 per cent. dead fruit-buds on those treated with oil, a very low percentage on those unsprayed or treated with soluble sulphur, and none on trees treated with lime-sulphur. One of the proprietary miscible oils caused considerable damage to wood and bark, and killed many leaf-buds on both peach and pear. A further application in early spring gave similar results, but late spring treatment caused comparatively little trouble.

It is therefore concluded that autumn and early spring application of some miscible oils is unsafe on peaches, though little injury may be expected as the result of late spring treatment. Though lime-sulphur appeared very harmless in these experiments, it may be responsible for damage in some places under little-understood conditions. No lubricating oils were used in the experiments, but these are used regularly with satisfactory results in southern districts as soon as the leaves have fallen in autumn. Apples have been less influenced by oil than other fruits, though the blossoms of one variety were advanced several days by a late dormant application of a miscible oil.

Recent work in Michigan has also shown that applications of oil to foliage will reduce transpiration. It is possible that the building up of the food of the plant might be seriously hindered in this manner, the heavy coating of oil retarding the gaseous exchanges between the air and the leaf.

JEWETT (H. H.). **The Mexican Bean Beetle.**—*Kentucky Agric. Expt. Sta., Circ. 36*, pp. 3-18, 7 figs. Lexington, Ky., March 1927.  
[Recd. August 1927.]

The bionomics of the Mexican bean beetle [*Epilachna corrupta*, Muls.] in Kentucky are discussed. The adults emerge from hibernation in May or the first week in June. The incubation period varies

from 5 to 10 days, but as a rule lasts about a week. The larvae are full grown in 14-21 days, and the pupal period usually lasts 5-10 days. Three generations may develop during the season, the adults of which appear towards the end of June and beginning of July, during the first part of August, and about the middle of September. Experiments were carried out in 1925 and 1926 to test the value of various insecticides against *E. corrupta*, the resulting recommendations being similar to those made by other authors [*R.A.E.*, A, xiii, 118, 262, etc.].

GUYTON (T. L.) & KNULL (J. N.). **Mexican Bean Beetle in Pennsylvania.**—*Pennsylvania Dept. Agric.*, Gen. Bull. 447, 9 pp., 5 figs. Harrisburg, Pa., 1st June 1927.

The bulk of this information on *Epilachna corrupta*, Muls. (Mexican bean beetle) in Pennsylvania is contained in a bulletin already noticed [*R.A.E.*, A, xiv, 352]. In southern Pennsylvania there were two generations in 1926. The overwintering adults appeared on the bean plants soon after the first leaves were formed. The larvae hatching from eggs laid by these beetles matured during the first part of July, and the first generation adults appeared about 1st August. The resulting larvae were full-grown about the middle of September and the adults entered hibernation.

LEACH (B. R.), LIPP (J. W.) & FLEMING (W. E.). U.S. Bur. Ent. **Control of Japanese Beetle Grubs.**—*Pennsylvania Dept. Agric.*, Gen. Bull. 440, 21 pp., 8 figs. Harrisburg, Pa., 15th February 1927. [Recd. August 1927.]

The first part of this paper is by Leach and Lipp and deals with the control of the larvae of the Japanese beetle [*Popillia japonica*, Newm.] in lawns by means of carbon bisulphide or lead arsenate [*R.A.E.*, A, xiii, 568; xv, 444]. As the larvae burrow deeper into the earth when the surface dries, it is advisable to maintain the turf in a moist condition for 2 or 3 days before treating with carbon bisulphide. The experiments with lead arsenate indicate that the use of nitrogenous fertilisers will not be necessary to such a great extent in poisoned turf. Ammonium sulphate and well rotted manure may be used, but lime, acid phosphate, potash salts or mixed fertilisers should not be employed at any time before or after planting, as they are not compatible with lead arsenate.

The second part is by Leach and Fleming on the treatment of nursery stock for the control of *P. japonica*. Carbon bisulphide has been found to be the only chemical suitable for the destruction of the larvae in the soil around the roots of plants. A satisfactory method of treating nursery stock is to place a galvanised iron collar round the base of the tree, this collar should be 9 inches deep and long enough to enclose a space 12-18 inches larger than the ball of earth that is to be left round the roots of the plant when the latter is dug up. The collar is sunk into the ground to a depth of 3 inches, and the carbon bisulphide emulsion is poured into the container thus formed and allowed to percolate through the soil about the roots of the plant. All weeds, etc., should be removed from the soil round the base of the plant to be treated, the soil should be levelled and any low hanging branches should be tied up. The soil should be tightly packed on each side of the metal band and banked up on the outside to a height

of 3-4 inches. Where the area to be treated is more than 4 ft. in diameter, or when the plants are growing closely together in beds, it is advisable to use square collars placed one against the other, as it has been found that in practice the levelling necessary for even distribution of the liquid is difficult on soil more than 4 ft. wide.

To make the stock solution 70 parts carbon bisulphide should be mixed with 30 parts soap mixture, the latter consisting of 135 cc. 7 per cent. sodium hydroxide solution, 50 gm. powdered lump resin, 450 cc. water, and 50 cc. oleic acid, mixed in the order mentioned and well agitated before the addition of each fresh substance. The concentration and amount of emulsion required varies with the temperature and area of the soil to be treated, and is shown in tables.

This treatment is not recommended under certain conditions, such as a high water table and inadequate drainage, hilly ground where a level basin cannot be obtained, soils with a high peat content, ground that has been tunnelled and undermined by moles and rodents, and where plants have been recently transplanted.

Plants that have been root-pruned and possess a deep mass of fibrous roots at the time of treatment are rarely injured, but those that have not been root-pruned may be seriously damaged. Late spring treatment, when growth is progressing rapidly, has not been entirely satisfactory.

JEWETT (H. H.). **The Striped Cucumber Beetle.**—*Kentucky Agric. Expt. Sta., Circ. 37*, pp. 21-34, 5 figs. Lexington, Ky., March 1927. [Recd. August 1927.]

The various stages and the general habits of the striped cucumber beetle [*Diabrotica vittata*, F.] as occurring in Kentucky are briefly described [cf. *R.A.E.*, A, xiv, 352]. An account is given of tests with various dusts and sprays for the control of this pest, as a result of which a dust consisting of 1 lb. lead arsenate and 10 lb. gypsum is recommended. This was applied at the rate of 25-70 lb. to the acre on cantaloup melons and at the rate of 20-60 lb. on cucumbers. There was very little injury by the beetle on these plots and no dwarfing or scorching of the foliage was observed. The yield from them was 459 lb. and 486 lb. for cantaloups and cucumbers respectively, as compared with 137 and 124 lb. on the untreated plots. The results obtained with a dust consisting of 1 lb. calcium arsenate and 20 lb. gypsum were very similar, and in addition this dust is much cheaper. The results were not so good when hydrated lime was used as the carrier. Sprays on the whole were less satisfactory than the dusts; the best results were obtained with 1½ lb. calcium arsenate, 1½ lb. hydrated lime and 50 U.S. gals. water, the yield in this case being 402 lb. of cantaloups. The choice between the dust and spray may depend to a considerable extent upon the available equipment and the experience of the grower. Though the actual materials for the dusts are more expensive than those required for spraying, the time and labour saved more than compensate for this.

A dust containing 2 per cent. free nicotine failed to control the beetles and one made of 90 per cent. hydrated lime and 10 per cent. nicotine sulphate gave very little better results. This was largely due to the weather conditions prevailing in 1926. Nicotine dusts containing 4-10 per cent. of nicotine sulphate have been used with good

results, but should only be applied on clear calm days with a temperature of not less than 65°F., and preferably 70° F. or higher. The foliage should be dry.

Sodium fluosilicate, even when diluted at the rate of 1 lb. to 5 lb. of hydrated lime, caused considerable scorching of the cucumber foliage and gave a poor yield [cf. *R.A.E.*, A, xiv, 273].

Other measures recommended are clean cultivation, the stimulation of plant growth by the application of fertilisers, the sowing of an excess amount of seed or, where injury is very severe, the sowing of seed at about weekly intervals, and the care of the young plants. The last includes the daily examination of the fields in the spring for the presence of beetles, and the breaking up of the soil, should a crust form when the young plants are emerging. If this is not done the beetles will crawl down beside the young plants and may destroy them.

BLISS (C. I.). U.S. Bur. Ent. **The Oviposition Rate of the Grape Leaf Hoppers.**—*Jl. Agric. Res.*, xxxiv, no. 9, pp. 847–852, 1 fig., 7 refs. Washington, D.C., May 1927.

The following is taken from the author's summary: In a study of the daily rate of oviposition by overwintering grape leafhoppers, *Erythroneura tricineta* var. *cymbium*, McAtee, *E. comes*, Say, and *E. comes* var. *compta*, McAtee, showed much greater productivity on *Vitis labrusca* stocks than on vines predominantly *V. vulpina*. *E. vitis*, Harr., and *E. vitifex*, Fitch, on the other hand, were more productive on *vulpina* stocks. Both of these conditions agree with the distribution of the respective species in the field.

As regards the effect of environmental conditions, temperature was found to condition oviposition more by its indirect effect upon egg development than by direct action on egg deposition. The effect of density of population was slight. The action of seasonal changes on rate of egg-laying agreed with the relative abundance of the different species in the field. The total effect of the environment in these experiments was not large, but probably did not omit any important factor common to all the experiments.

DOZIER (H. L.). **An undescribed White Fly attacking Citrus in Porto Rico.**—*Jl. Agric. Res.*, xxxiv, no. 9, pp. 853–855, 3 figs., 1 ref. Washington, D.C., May 1927.

All stages of *Paraleuroides naranje*, sp. n., are described from Citrus in Porto Rico, where it does not appear to be of economic importance. This whitefly in all its stages, including the egg, lies amid very short fine waxen rods scattered over the lower surfaces of the leaf. One female of *Encarsia variegata*, How., known as a parasite of *P. perseae*, Quaint., in Florida, was reared from *P. naranje* in 1925, and 61.2 per cent. of the pupa cases examined showed evidences of parasitism.

CAESAR (L.). **Insects attacking Vegetables.**—Ontario Dept. Agric., Bull. 325, 63 pp., 46 figs. [Toronto] May 1927.

A short account is given of the insect pests of vegetables occurring in Ontario, arranged according to the crops they attack, or under the designation of general feeders, with notes on control measures for each. The usual stomach and contact poisons are described, and instructions are given regarding suitable spraying and dusting machines.

CAESAR (L.). **Some Insects attacking Vegetables.**—Ontario Dept. Agric., 22nd Ann. Rept. Veg. Growers' Assoc. 1926, pp. 14-17. Toronto, 1927.

Insects briefly dealt with are the European corn borer [*Pyrausta nubilalis*, Hb.]; the onion thrips [*Thrips tabaci*, Lind.]; the onion maggot [*Hydemyia antiqua*, Meig.]; the carrot rust fly [*Psila rosae*, F.]; and the striped cucumber beetle [*Diabrotica vittata*, F.].

**Decreto que prohíbe la entrada de la papa extranjera atacada por plagas.** [Decree prohibiting the Entry into Mexico of Foreign Potatoes attacked by Pests.]—Mexico: Sec. Agric. y Fomento, Bol. mens. Defensa agríc., i, no. 2, pp. 66-69. S. Jacinto, D.F., June 1927.

The importation into Mexico of diseased potatoes and of those infested by the potato moth, *Phthorimaea operculella*, is prohibited.

**Las plagas del algodónero.** [Pests of the Cotton Plant.]—Mexico: Sec. Agric. y Fomento, Bol. mens. Defensa agríc., i, no. 2, pp. 70-84, 1 map. S. Jacinto, D.F., June 1927.

*Anthonomus grandis*, Boh., a cotton pest of many years' standing in Mexico, now appears to be satisfactorily controlled by the dusting of calcium arsenate from aeroplanes. *Platyedra* (*Pectinophora*) *gossypiella*, Saund., was introduced from Egypt in 1911. The treatment of the seed by heat, the destruction of all the plants after the crop, and the flooding of the fields are the measures that have been taken against this pest. The establishment of vacuum fumigation stations is most desirable.

DAMPE (A.). **Observaciones sobre el estado actual del servicio de sanidad agrícola de México.** [Notes on the present State of the Plant Protection Service of Mexico.]—Mexico: Sec. Agric. y Fomento, Bol. mens. Defensa agríc., i, no. 2, pp. 85-92. S. Jacinto, D.F., June 1927.

The various steps in the establishment of a plant protection service in Mexico since its first initiation in 1900 are reviewed. The National Junta for Locust Control, instituted in 1925, was abolished at the end of 1926 owing to the decrease of *Schistocerca paranensis*. At present the "Oficina para la Defensa Agrícola" discharges the functions exercised in the United States by the Federal Horticultural Board, the Bureau of Entomology, and the Office of Mycology and Plant Disease of the Bureau of Plant Industry.

COPPEL RIVAS (E.). **Actividades de la Defensa Agrícola de México en materia de cuarentenas, inspecciones y fumigaciones.** [Work of the Agricultural Defence Service of Mexico regarding Quarantines, Inspections and Fumigations.]—Mexico: Sec. Agric. y Fomento, Bol. mens. Defensa agríc., i, no. 2, pp. 93-112. S. Jacinto, D.F., June 1927.

This is the text of a report to the international meeting of the Western Plant Quarantine Board held at Reno, Nevada, in June 1927.

BONDAR (G.). **O podador, *Chalcodermus bondari*, Marsh. Nova praga do algodoeiro na Bahia.** [The Pruner, *C. bondari*, Mshl. A new Pest of Cotton in Bahia.]—*Chacaras e Quintaes*, xxxvi, no. 2, pp. 177–179, 2 figs. S. Paulo, 15th August 1927.

*Chalcodermus bondari*, Mshl. [R.A.E., A, xv, 237] was first noticed in 1925 in the cotton fields of Bahia. The adult weevil bores into the twigs to oviposit, and at these points the tips of the twigs bend over or break off. The resultant withering must be unfavourable to the growth of the plant, while many flowers and bolls are lost. The egg hatches in 2–3 days, and the larva is full-grown in 7–8 days, after which it enters the ground, where it passes about 10 days before pupating. The adult emerges about 20 days later. In the laboratory the complete life-cycle required a little under two months. The adult hides in the ground by day. *C. bondari* has evidently passed to cotton from some unknown indigenous plant.

PICKEL (B.). **Ainda existe quem queira comprar cuyabanas?** [Are there still Buyers of *Prenolepis*?]—*Chacaras e Quintaes*, xxxvi, no. 2, pp. 184–185, 1 fig. S. Paulo, 15th August 1927.

Attempts are still sometimes made in Brazil to establish *Prenolepis fulva*, Mayr, and other ants of the same genus, against the leaf-cutting ant [*Atta sexdens*, L.]. *P. fulva* is, however, extremely injurious, and in one case from 80 to 100 per cent. of the sugar-cane on one estate was destroyed by *Aphis sacchari*, Zehnt., *Pseudococcus brevipes*, Ckll. (*bromeliae*, auct.), and *P. boninsis*, Kuw. (*calceolariae*, auct.), all of which were tended and protected by this ant.

WHITNEY (L. A.). [Report of the] **Division of Plant Inspection, December 1926 and January–March 1927.**—*Hawaiian Forester & Agric.*, xxiv, no. 1, pp. 20–23. Honolulu, 1927.

The pests intercepted include: From California, *Pseudococcus* spp. on fresh bananas, *Amaryllis* bulbs and rose plants, *P. citri*, Risso, on *Begonia* and *Coleus*, *P. maritimus*, Ehrh., on *Gladiolus* bulbs, *Fuchsia* cuttings and flowering peach, *P. gahani*, Green, on *Citrus* stock, *P. adonidum*, L. (*longispinus*, Targ.) on *Gladiolus* bulbs, *Aulacaspis rosae*, Bch., and *Macrosiphum rosae*, L., on rose, *Saissetia oleae*, Bern., on *Citrus* and *Erica melanthera*, and *Orthozia insignis*, Dougl., on *Coleus*; from Pennsylvania, *Lecanium* sp. on rose; from Michigan, *Dialeurodes citri*, R. & H., and *Coccus* (*Lecanium*) *hesperidum*, L., on *Citrus*; from the Philippines, *Bruchus chinensis*, L., in dried beans, *Lepidosaphes* sp. on fresh betel nuts, and *Saissetia* sp. and *Pseudococcus* sp. on orchids; from Japan, the Nitidulid, *Glischrochilus* (*Librodor*) *japonius*, Motsch., and the Cistelid, *Allecula fuliginosa*, Mäkl., in *Paulownia* logs, and *Curculio* (*Balaninus*) *camelliae*, Roel., in chestnuts; and from China, larvae and adults of *Cylas formicarius*, F., in sweet potatoes.

ULTÍE (A. J.). [Pests of Green Manure Plants and Coffee in 1926.]—*Meded. Proefst. Malang*, no. 62, pp. 18–23. Soerabaya, 1927.

*Xyleborus morigerus*, Bldfd., was found in the stems of *Crotalaria anagyroides* and *C. usaramoensis* in East Java. The seed of the latter was occasionally attacked by the larva of *Catochrysops* (*Lycaena*)

*cnejus*, F. *C. anagyroides* was infested by the Capsid, *Ragmus importunitas*, Dist., Noctuids and the Fulgorid, *Lawana candida*, F. Pests of *Tephrosia* included *Araecerus fasciculatus*, DeG., attacking the seeds, and *Pseudococcus virgatus*, Ckll., on the leaves. This mealybug also infested the leaves, pods and stems of *Calopogonium*. A Meloid beetle, *Epicauta ruficeps*, Ill., occurred on *Centrosema pubescens*; its larvae attack the eggs of grasshoppers. Caterpillars, including *Dichomeris ianthes*, Meyr., defoliated *Indigofera endecaphylla*; the Geometrid, *Hyposidra talaca*, Wlk., defoliated *Mimosa invisa*. Lamtoro [*Leucaena glauca*] was attacked by twig-borers [*Xyleborus*], *P. virgatus*, and the berry borer [*Stephanoderes hampei*, Ferr.].

The chief pest of coffee was the twig-borer [*Xyleborus*]. The mealybug, *P. citri*, Risso, was becoming troublesome when checked by the rains. The berry borer [*S. hampei*] did little injury owing to various circumstances, such as the sharp division of the crops by the weather conditions and thorough harvesting. The breeding of the parasite [*Prorops nasuta*, Wtrst.] is being continued.

LIGHT (S. S.). **Report of the Entomologist for 1926.**—*Tea Res. Inst. Ceylon*, Bull. no. 1, pp. 16-20. Kandy, 1927.

The severe, concentrated attacks of *Homona coffearia*, Nietn. (tea tortrix) that occurred on tea in past years in Ceylon seem to be giving place to milder outbreaks spread over considerable areas, making control increasingly difficult, while the range of both wild and cultivated food-plants is being steadily increased. *Xyleborus fornicatus*, Eichh. (shot-hole borer) is occasionally reported on young tea bushes, but appropriate manuring is doing much to counteract the effect of attack. Local outbreaks of the Limacodids, *Spatulifimbria* (*Spatulicraspeda*) *castaneiceps*, Hmps., and *Thosea cana*, Wlk. (green nettle grub) were largely controlled by parasites. Several outbreaks of *Zeuzera coffeae*, Nietn. (red borer) occurred on tea in nurseries, but the pruning of affected stems and prompt destruction of grubs prevented extensive loss. Against the cutworm, *Agrotis ypsilon*, Rott., which also attacks the tea in nurseries, preliminary trials have been made with baits; the indications are that cabbage and sweet potato leaves, spread over the beds between the plants a few inches apart, may be used advantageously as traps, and should be examined early each morning for cutworms sheltering beneath. Considerable damage to tea in nurseries was caused by *Heterodera radicolica*, Greeff, which also occurred on *Albizzia* seedlings. A detailed account of the mites attacking tea has been noticed elsewhere [*R.A.E.*, A, xv, 359]; minor pests included *Psyche albipes*, Moore (small bagworm), *Stauropus alternus*, Wlk., *Terias silhetana*, Wall., which is normally a pest of *Albizzia*, but is parasitised by a Tachinid, and *Saissetia hemisphaerica*, Targ.

On dadap (*Erythrina lithosperma*) *Myllocerus curvicornis*, F. (dadap weevil) is very abundant and widespread, riddling the foliage and thereby destroying a considerable weight of green manure. It is possible that the weevil breeds in decayed stumps of branches that have died back after pruning; it occasionally attacks tea. *Albizzia lophantha*, a recently introduced species, suffers severely from attacks of *H. coffearia*, and a Coccid occurs on the roots. *Gliricidia maculata* is attacked by a Coccid that induces the presence of so much sooty mould that tea bushes underneath are sometimes retarded in their growth by the mould that falls upon them. *Tephrosia candida* is

attacked by *Araecerus fasciculatus*, DeG., and the larvae of several moths, particularly *Maruca testulalis*, Geyer, and *Etiella zinckenella*, Tr., which infest the pods and have destroyed the entire seed-crop on some estates. Seedlings in some cases showed injury similar to that caused by *Heterodera* and were being killed rapidly in consequence of it.

LIGHT (S. S.). **A Review of the Present Situation regarding Tea Tortrix in Ceylon.**—*Trop. Agriculturist*, lxxviii, no. 6, pp. 349–362, 12 refs. Peradeniya, June 1927.

The author reviews the various methods that have been employed for the control of the tea tortrix [*Homona coffearia*, Nietn.] in Ceylon, and reaches the same conclusion as Hutson [*R.A.E.*, A, xv, 218], namely, that the collection of egg-masses and caterpillars is the only method that can at present be recommended, and that this should be carried out simultaneously throughout the infested area.

TURNER (A. J.) & SEN (D. L.). **The Use of Hydrocyanic Acid Gas for the Fumigation of American Cotton on Import into India.**—*Agric. Jl. India*, xxii, pt. 3, pp. 173–175. Calcutta, May 1927. [Recd. August 1927.]

This is a short account of the results of experiments with hydrocyanic acid gas for fumigating cotton bales against *Anthonomus grandis*, Boh. (boll weevil) as a precaution against its importation into India from America, the full details of which are to be published shortly. The work in India was confined to *Calandra* (*Sitophilus*) *oryzae*, L. (grain weevil) [*cf. R.A.E.*, A, xiv, 233], but it was subsequently arranged with the American authorities to repeat the work using *A. grandis*. The conclusion is drawn that under Bombay conditions the weevils would be exterminated by an exposure for 4 hours to a concentration of 450 parts HCN per 100,000 by volume or for 20 hours to a concentration of 150 per 100,000 (calculated as at normal pressure and temperature). For practical purposes it is best to combine a short period (6 hours) at a high concentration with a long period (a further 14 hours) at a lower concentration. The minimum initial concentration for the second period should be 200 parts HCN per 100,000.

Fumigation can be satisfactorily carried out on a large scale in barges, when these are sound and the bales are both dry and also compressed to a high density, one pound of sodium cyanide being sufficient for about 5 bales of cotton. These results have lead the Government of India to issue a notification under the Destructive Insects and Pests Act [*R.A.E.*, A, xiv, 88]. Though cotton does absorb hydrocyanic acid gas, it is fairly rapidly and completely discharged, and there is no evidence of the occurrence of any irreversible chemical combination.

**Fruit Tree Pests—Aphides and Apple Sucker.**—*Govt. N. Ireland : Minist. Agric.*, Leaflet no. 11 (revised), 7 pp., 2 pls. Belfast, May 1927. [Recd. August 1927.]

In this leaflet dealing with Aphids attacking fruit trees and bushes, and with the apple-sucker [*Psylla mali*, Schmid.], which is a revision of one previously noticed [*R.A.E.*, A, xi, 391], the formulae for some of the insecticides recommended are modified and additional information is given in regard to tar distillates.

SMITH (L. E.). **Investigations on Tar Distillate Spray Fluids.**—*Ann. Rept. Agric. & Hortic. Res. Sta., Long Ashton, Bristol, 1926*, pp. 82-87. Bristol [1927].

Owing to the rapid increase in the use of tar distillates as winter washes for fruit trees, the need has arisen for thorough chemical investigations of these fluids, and this paper summarises the results of research into the various factors concerned in the preparation of clear concentrated tar oil fluids and stable dilute tar oil emulsions.

Attempts were made to emulsify a tar oil containing 12 per cent. phenolic materials with soaps prepared from various oils such as resin, fish, soy-bean, bone, coconut, linseed and castor. No emulsion could be obtained with resin soap, and the other emulsions were all unsatisfactory except that made from castor oil, which although fairly stable was thick. In a tar oil containing 25 per cent. phenolic materials and 4.4 per cent. bases, a concentrated solution of castor oil soap dissolved immediately, giving a clear solution that could be diluted with water, yielding a pink emulsion. The other soaps could be used in the same way but gave less stable emulsions.

It was found that fatty acid soaps could not be dissolved in neutral oil prepared by removing the acidic and basic materials from tar oil, but when tar acids, such as phenol or cresol, were added, a clear solution resulted on shaking. Tar bases, such as quinoline and pyridine, acted in the same manner, but were not so suitable because larger quantities were necessary and the emulsions obtained from the solutions were not so stable as those prepared by the use of acids, unless more soap was used.

The physical properties of concentrated tar oil fluids were investigated; they do not appear to be either water-in-oil or oil-in-water emulsions. It was found that on the gradual addition of water followed by shaking, the water was at first dissolved by the fluid, forming a homogenous solution, but after a time a point was reached where the further addition of water caused turbidity, and the mixture tended to separate into layers. The mixtures of tar oil fluids and water were stable when the concentration of the former did not exceed 25 per cent., this maximum concentration depending on the composition of the oil. In concentrated unstable tar oil emulsions the particles were heterogeneous and tended to coalesce on standing; on dilution the size of the particles in such emulsions remained unaltered and hence the resultant emulsions were unstable.

In order to obtain stable emulsions by diluting concentrated tar oil fluids, it is necessary that the diluted emulsions should contain less than 25 per cent. tar oil; an excess of soap over the minimum amount required to produce the clear fluids is generally essential; the choice of soap should be governed to a large extent by the composition of the oil; and the original tar oil should contain at least 15 per cent. of tar acid of the efficiency of cresol. Castor oil soap alone gave the best results in producing stable emulsions when the tar acid content of the tar oil fluid exceeded 15 per cent., but a mixture of equal parts of castor oil and resin soaps was most efficient when the tar acid content was below this amount. Although resin soap used alone produced clear concentrated solutions, emulsions formed from these tended to cream. Other tests showed that these emulsions are not particularly sensitive to the presence of electrolytes, such as salts of aluminium, calcium and magnesium, caustic soda or hydrochloric acid, and that these are not likely to be encountered in natural waters in concentrations sufficient to produce instability.

STANILAND (L. N.). **Oil Sprays for Spring and Summer Use** (Progress Report).—*Ann. Rept. Agric. & Hortic. Res. Sta., Long Ashton, Bristol, 1926*, pp. 78-81. Bristol [1927].

Experiments are being made with oil sprays to test the possibility of using them as cheap contact sprays in place of nicotine. The object is to find an oil spray that will be half the price of nicotine, that will emulsify readily without heat, so that it can be easily mixed in the field by the grower (the emulsifying substance to be readily obtainable in a standard form), that will not damage foliage and that will be an effective insecticide. Various mineral and vegetable oils have been tested in conjunction with various emulsifiers, such as ordinary spraying soaps of various consistencies and qualities, castor oil soap, casein-lime, soluble organic casein, saponin, clay and size. Caustic soda and caustic potash were also tried with the vegetable oils, to determine whether the oils would emulsify with their own soaps formed by action with the alkali; this did not take place in the cold. The mineral oils were discarded as a result of tests with the emulsifiers; of the vegetable oils linseed oil and rape oil were selected for further tests.

To prepare the spray, the required quantity of oil is poured into a bucket, capable of holding at least double the amount, and an equal quantity of an 8 per cent. soap solution is poured into a similar bucket. Ordinary soft soap gave the best emulsifying results; the form known as liquid soap, composed of one part of soap and two of water, was found to be most convenient. The oil is poured into the soap, and the mixture poured backwards and forwards until emulsification is complete. In the case of rape oil one pouring is almost sufficient, but it is advisable to make at least 4 pourings to complete the process. The main bulk of the water in the spraying tank should have sufficient soap added to it to form a lather. It has been found that 1 per cent. of "free" soap in the final wash gives optimum wetting power. The primary emulsion is added to the main bulk and stirred thoroughly. With very hard water, washing soda should be added to soften the water, as it is cheaper than soap alone.

In field tests linseed oil showed a lower killing power than rape oil and was unsuitable as it "varnished" quickly owing to the thinness of the film deposited on the plant and insect. Rape oil was very satisfactory and caused less damage to foliage than the proprietary mineral oil tested in the previous year. The latter slightly scorched the leaves of *Salix purpurea* at  $\frac{1}{2}$  per cent. strength and caused serious damage when increased to 1 per cent. The rape oil emulsion (containing 1 per cent. free soap) can be used up to 2 per cent. strength without scorching the leaves. At this strength it killed the woolly apple aphid [*Eriosoma lanigerum*, Hausm.], full-grown larvae of *Phyllodecta vulgarissima*, L. (willow beetle) and of the willow sawfly [*Pteronius salicis*, L.], and nearly full-grown larvae of the gooseberry sawfly [*P. ribesii*, Scop.]. At a 1 per cent. strength it killed the rosy apple aphid [*Anuraphis rosaeus*, Baker], half-grown larvae of *Phyllodecta vulgarissima*, young larvae of *Pteronius salicis* and of the winter moth [*Chematobia brumata*, L.], and newly hatched larvae of *P. ribesii*. Rose Aphids, willow Aphids [*Cavariella capreae*, F.] and *Aphis pomi*, DeG., were killed by  $\frac{1}{2}$  per cent. concentration. At this strength it did not scorch the petals of roses, while a 5 per cent. concentration applied to apples just before the "pinking" stage only caused very slight scorching. Up to 3 per cent. strength has been used on black currant in almost full leaf.

Rape oil washes have apparently many advantages; as a delayed dormant wash at 1 per cent. strength they could be used to replace tar-distillate washes where undercrops, weather conditions or insufficient labour prevent the use of the latter.

**Report on Advisory Work, 1925-26. Economic Entomology.**—*Ann. Rept. Agric. & Hortic. Res. Sta., Long Ashton, Bristol, 1926*, pp. 125-134. Bristol [1927].

Among the more important pests recorded during the year the Carabid, *Harpalus ruficornis*, F., caused considerable damage by eating the surface of strawberry fruit. The attack frequently started near a hedgerow. *Argyresthia ephippiella*, F. (cherry fruit moth) appears to be increasing in one district. The situation with regard to *Plesiocoris rugicollis*, Fall., is much the same as in the previous year [*R. A. E.*, A, xiv, 464]. Experiments against it with a tar-distillate at 10 per cent. strength on apples have confirmed the results then obtained. The value of such a spray, however, is largely governed by the weather conditions following the application. Although an identical wash was used on apples and black currants growing in the same orchards, good control of the eggs on apple was obtained, but only poor control of the eggs on the currants.

Various essential oils and other substances have been tried as possible attractants for *Contarinia pyrivora*, Riley (pear midge). They were mixed with banding grease and exposed on boards hung in the trees. Of the 16 substances tested, oil of bitter fennel, clove oil and nitrobenzene (oil of mirbane) were sufficiently promising to justify further experiments. Tests have been made with a proprietary oil and with rape oil for the control of *Phorodon humuli*, Schr. (hop aphid). Both were used at a strength of  $\frac{1}{2}$  per cent. [see preceding paper], and killed practically all the Aphids. The applications were made at a pressure of 50-60 lb. to the square inch through a medium fine nozzle on 29th June. The same rape oil emulsion was tried with and without sulphur compounds for the control of *Tetranychus telarius*, L. (*althaeae*, v. Hanst.). No scorching was observed after the use of 1 per cent. strength except when used with the sulphur compounds. The effect on the red spider has not yet been determined owing to the small numbers of this mite present, and for the same reason the results of treatment of the soil with calcium cyanide to kill hibernating mites before they migrated upwards were inconclusive, but the plants were not injured. In a preliminary trial of paradichlorobenzene as a soil fumigant against the root form of *Eriosoma lanigerum*, Hausm. (woolly apple aphid) good results were obtained without injury to the tree.

In attempts to control *Aphelenchus fragariae*, R.-B. (strawberry eelworm) by means of hot water, it was impossible to obtain a temperature and time that would destroy all the eelworms without injuring the plants.

Many failures in budding apples and plums were associated with the presence of the larvae of a Cecidomyiid, which were found under the bark of the stocks, and apparently caused the death of the cambial tissues; a mould was present wherever the larvae were found, but the latter appeared to be primarily responsible. Several substances were used for painting buds immediately after tying, and of these vaseline

appeared to be entirely successful in preventing the appearance of the larvae or the mould, without injuring the buds, but further tests on a larger scale are necessary before recommendations can be made.

TRAPPMANN (W.). **Schädlingsbekämpfung. Grundlagen und Methoden im Pflanzenschutz.** [Measures against Pests. The Bases and Methods in Plant Protection Work.]—viii+440 pp., 64 figs. Leipzig, S. Hirzel, 1927. Price, paper M.20; cloth M.22.

This volume is a compilation of information on measures against plant pests designed to serve as a text and reference book for applied biologists and technical workers in plant protection and in the manufacture of insecticides, etc. A general discussion of plant diseases and pests, particularly insects, is followed by chapters on cultural and biological methods of controlling them and on physical agents and mechanical methods such as trapping. Two-thirds of the book, however, is devoted to chemical methods of all kinds. A description of the organisation of measures and a survey of the more important pests in Germany complete a useful work.

HUSFELD (B.). **Beitrag zur Züchtung von nematodenimmunen Zuckerrüben.** [A Note on the Breeding of Sugar-beets immune from Nematodes.]—*Deutsche Zuckerind.*, li, p. 45, 1926. (Abstract in *Neuheiten Geb. Pflanzenschutzes*, 1927, no. 3, pp. 78-79. Vienna, 1927.)

Some young beet plants in land infested with Nematodes were found to be free from cysts. They were cultivated apart for seed, but the ten thousand plants raised from such seed were infested to the same extent as others obtained from seed from infested plants.

MAHLER (E.). **Stärkeres Auftreten forstschädlicher Insekten in Süd- und West-Thüringen 1925.** [The Abundance of Insects injurious to Forests in South and West Thuringia in 1925.]—*Forstarchiv*, ii, p. 149, 1926. (Abstract in *Neuheiten Geb. Pflanzenschutzes*, 1927, no. 3, p. 80. Vienna, 1927.)

In the summer and autumn of 1925 *Epiblema (Tortrix) tedella* severely infested the spruce forests of South Thuringia. *Tortrix viridana* was abundant in South and West Thuringia, all old oaks being defoliated. Pine stands along the Werra river were infested by the pine moth, *Bupalus (Geometra) pinarius*, 10-20 per cent. of the pupae of which were parasitised by *Ichneumon nigritarius*.

SCHIMITSCHEK (E.). **Vergleichende Studien zur Kenntnis des *Ips amitinus*, Eichh., und des *Ips cembrae*, Heer.** [Comparative Studies of *I. amitinus* and *I. cembrae*.]—*Zentralbl. ges. Forstwesen*, lii, pp. 65-75, 44 figs. Vienna, 1926. (Abstract in *Neuheiten Geb. Pflanzenschutzes*, 1927, no. 3, p. 80. Vienna, 1927.)

*Ips amitinus*, Eichh., which has one generation a year, predominates in the higher parts of the Alps on *Pinus cembra* and spruce; it disappears at low altitudes, where it is replaced by *I. cembrae*, Heer, which is found on larch and, to a less degree, on spruce. The latter has two generations a year. Primary infestation of larch by *I. cembrae*

occurs in South Moravia. There is no difference between individuals of *I. amitinus* on *P. cembra* and on spruce. *I. amitinus* var. *montanus*, Fuchs, found on *P. cembra* in the Engadine is local and does not occur throughout the Alps.

KLEINE (R.). **Die Anfälligkeit des Hafers in Gemengsaat gegen die Fritfliege.** [The Susceptibility to Attack by the Frit Fly of Oats in Mixed Sowings.]—*Fortschritte Landw.*, ii, no. 17, pp. 546–550. Vienna, 1st September 1927.

In a series of experiments in 1926 in Pomerania a variety of oats resistant to the frit fly [*Oscinella frit*] was sown in various admixtures with other oats, barley, peas and beans. In a second series a susceptible variety was sown in the same manner. The resistance of the one variety and the susceptibility of the other were confirmed by this means. Early sowing in heavy soil did not result in loss by the fly, but in light soil the susceptible variety was affected because such soil does not provide enough nutriment for the plant and its slow growth allows time for attack to occur. Late sowing in light ground produced severe losses in the susceptible variety, though in heavy soil it was not much affected. On an average, late sowing produced a smaller crop than early sowing; the difference was slight for the resistant variety and marked for the susceptible one. In the mixed sowings the leguminous plants quickly covered the young oat seedlings and reduced the attack by the fly. A careful choice of the seed mixture can therefore limit the losses by this pest.

SPEYER (W.). **Von der Bekämpfung des Apfelsaugers an der Niederelbe.** [The Control of the Apple Sucker on the Lower Elbe.]—*Nachricht-enbl. deutschen Pflanzenschutzdienst*, vii, no. 9, pp. 85–88. Berlin, September 1927.

The information in this account of work against the apple-sucker [*Psylla mali*, Schm. is substantially the same as that in previous papers [*R.A.E.*, A, xv, 514, 515, etc.]. A list is given of forty-one brands of carbolineum, the effect of each on the eggs of this pest being shown.

TEMPEL (W.). **Zur Bekämpfung der Kirschblütenmotte (*Argyresthia ephippiella* F.).** [The Control of the Cherry Blossom Moth.]—*Nachrichtenbl. deutschen Pflanzenschutzdienst*, vii, no. 9, pp. 90–91. Berlin, September 1927.

*Argyresthia ephippiella*, F., has become a serious pest of cherries in Germany of late years. The author found carbolineum sprays against the eggs [*R.A.E.*, A, xiii, 18] to be unsatisfactory, but an arsenical dust in spring, as previously advised [A, xiv, 375], is recommended. Further work in 1926 shows that the dust is best applied when the young flower-buds just begin to appear; a second and, if possible, a third application should be made at intervals of about eight days, according to weather conditions. The practical value of the Encyrtid [probably *Agéniaspis atricollis*, Dalm.] recently recorded as a parasite of this moth [A, xv, 557] seems doubtful.

MORSTATT (H.). **Ueber Vorratsschädlinge und Vorratsschutz im tropischen Afrika.** [On the Pests and Protection of stored Products in tropical Africa.]-*Mitt. Ges. Vorratsschutz*, iii, nos. 4-5, pp. 56-58, 71-73. Berlin, August & September 1927.

This article emphasises the importance in tropical Africa of insect and fungus pests of stored products and the influence they have on the life and customs of the populations there.

PRELL (H.). **Ein Rüsselkäfer (*Codiosoma spadix* Herbst) als holzerstörendes Hausinsekt.** [A Weevil, *C. spadix*, as a Wood-destroying House Insect.]-*Mitt. Ges. Vorratsschutz*, iii, no. 5, pp. 61-64, 1 fig. Berlin, September 1927.

The weevil, *Codiosoma spadix*, Hbst., which usually occurs in rotting wood in forests, is recorded as infesting spruce floor-boards in a house in north Trentino. Other instances of the infestation of worked timber by Cossonine weevils are quoted from the literature.

MUCK (O.). **Vereinheitlichung der Nomenklatur auf dem Gebiete der Bienenpathologie.** [Uniformity in the Nomenclature of Bee Diseases.]-*Wiener tierärztl. Monatsschr.*, xii, p. 124. Vienna, 1925.

Confusion has been caused by variations in the names applied to diseases of bees in Germany, Austria and Switzerland, and a uniform system of nomenclature is here suggested and defined.

[SHEMBEL' (S. Yu.). Шембель (—). **Locusts in the Astrakhan Government during the Summer of 1926.** [In Russian.]-Nash Krai [Our Region], 1926, no. 8, reprint 13 pp. Astrakhan, 1926. [Recd. June 1927.]

Periodic outbreaks of *Locusta migratoria*, L., occur in Astrakhan at intervals of 12-14 years, one of which took place in 1912-14. Outbreaks of *Calliptamus italicus*, L., occurred in 1916 and 1918, but *L. migratoria* did not increase again till 1923. After that year's campaign the numbers of locusts decreased greatly and in 1925 it was thought that the danger was over, but in the autumn large swarms of locusts invaded Astrakhan from Daghestan and Uralsk. No serious damage to crops was reported, but pastures suffered severely, and oviposition occurred over a very large area. Control measures organised in the spring of 1926 against the hoppers were only partly successful owing to lack of funds.

[UVAROV (B. P.). Уваров (Б. П.). **Locusts and Grasshoppers. A Handbook for their Study and Control.** [In Russian.]-Bibliot. Khlopkovogo Dela [Lib. Cotton Ind.], no. 8, 8vo, 306 pp., 104 figs. Moscow, 1927. Price Rbl. 3.50.

The general part of this book gives a detailed outline of the morphology, anatomy and physiology, embryology and postembryonic development, behaviour, ecology and distribution, natural enemies and periodicity, and the technique and organisation of control of locusts and grasshoppers in general.

The special part deals with the species injurious in Russia, viz., *Dociostaurus maroccanus*, Thnbg., *Locusta migratoria*, L., *Calliptamus italicus*, L., *Gomphocerus sibiricus*, L., *Chorthippus scalaris*, F.W., *C. apricarius*, L., *C. albomarginatus*, Zett., *Dociostaurus crucigerus brevicollis*, Ev., *D. kraussi*, Ing., *Arcyptera microptera*, F.W., *A. fusca*, Pall., *Oedaleus decorus*, Germ., *Podisma pedestris*, L., *Prumna primnoa*, F.W., *Anacridium aegyptium*, L., and *Oxya fuscorivata*, Marsch. For each species a description is given of the stages and an account of the bionomics, while distribution and, especially, ecology are discussed at length.

In the concluding chapter the opinion is expressed that from the technical point of view the control of locusts does not present any difficulties, the poison bait method being considered the best of all under all conditions, but the effectiveness of control measures depends entirely on organisation. Further research on locusts and grasshoppers is, however, urgently needed, since the total information on the most vital problems of bionomics is exceedingly small, while a thorough understanding of the physiology and ecology of the insects is absolutely essential for developing schemes for preventing outbreaks. Detailed research on the anatomy, physiology and embryology of ACRIDIDAE, even if carried out without any practical end in view, would be immensely important to economic entomology.

A bibliography of about 300 references is appended, but comprises only the papers consulted, or considered of serious importance.

[VERMISHEV (Kh.).] Вермишев (Х.). **The Present Situation with regard to *Phylloxera* in Armenia.** [In Russian.]—*Vestnik Vinodel. Ukrain.*, xxviii, no. 7, pp. 387–393. Odessa, July 1927.

A preliminary survey of some of the vineyards in Armenia was carried out in 1925. *Phylloxera* was found to be present in about 600 acres, in an area of over 1,600. It had been suggested that quarantine measures should be enforced prohibiting the importation of American stocks, but the author considers that this is now unwarranted, as the Aphid is already well established and apparently widely distributed. He suggests, on the contrary, that every effort should be made to encourage the use of American stocks, and that experiments should be carried out without delay to ascertain the most suitable variety for local conditions.

BARBEY (A.). **Contribution à la biologie des Microlépidoptères phytophages: *Steganoptycha pygmaeana*, Hbn.**—*Rev. Zool. agric. & appl.*, xxvi, no. 4, pp. 56–59, 2 pls., 1 ref. Bordeaux, April 1927. [Recd. August 1927.]

*Tortrix (Steganoptycha) pygmaeana*, Hb., which has apparently been recorded on only two occasions (in 1895 in Denmark and in 1910 in Germany) as injurious in forests, has, during the last three summers, been present in great abundance in the Alps in Grisons (Switzerland), causing considerable damage to spruce [*Picea*] over an area of some 1,500 acres. The moths are observed about mid-May, flying round the tops of the trees, where they deposit eggs on the preceding year's needles, generally at the base. The larvae, immediately upon hatching,

proceed to the buds, where they devour the young needles, frequently retaining the cap of the bud by a network of silky threads. When three-fourths grown, the larva penetrates to the interior of the needle for food and shelter, but when full-grown a single needle is not sufficient and in many cases a number are joined together in a bundle by means of silky threads, and by the end of June or beginning of July a quantity of débris of broken and yellow needles can be observed hanging from threads on the branches or fallen to the foot of the tree. At the end of July or early in August, the larva descends by a thread to the ground, where it spins a cocoon of silk and woody débris that is very difficult to distinguish from the litter at the foot of the tree, and there it hibernates. The insect attacks perfectly healthy trees in full growth, and in the district in question infested *Picea* almost exclusively ; it was very rarely found on silver fir (*Abies pectinata*) and never on pine (*Pinus sylvestris*) growing in the same area. After three years, the infestation died down, probably owing in part to the wet weather in early June, 1926, which would destroy many of the young larvae on emergence from the egg. The fact that the insect is active for only two months considerably limits the injurious nature of its attacks.

FEYTAUD (J.). **La question doryphorique au début de la campagne 1927.**—*Rev. Zool. agric. & appl.*, xxvi, nos. 4 & 5, pp. 49–55 & 65–70, 2 maps. Bordeaux, April & May 1927. [Recd. August 1927.]

The changes that have taken place in the situation with regard to the Colorado potato beetle [*Leptinotarsa decemlineata*, Say] in France since the beginning of 1926 [*R.A.E.*, A, xiv, 517] are reviewed, the exact centres of infestation being shown on a map. In Gironde the situation is still serious, although the number of districts recorded as infested has been reduced from 58 to 44 ; while the original centres of infestation north-west of Bordeaux are now less intense, some other districts have been very severely attacked, and in particular the Island of Cazeaux has harboured the pest in increasing numbers for several years past. Outside Gironde the situation in the south is on the whole better than a year ago, both the extent and intensity of infestation having been reduced, but in the north and north-east of the infested region the position is most serious, especially in the land about the tributaries of the Charente. Fresh centres of infestation are still being found that should have been declared years ago ; five years' experience has proved that the present system of treatment is invariably efficacious, and that fresh foci can be exterminated if dealt with promptly. The chief difficulty, therefore, is to ensure the immediate déclaration of fresh infestations, and if only a sufficiently good organisation could be maintained, the complete extermination of the outbreak should be possible, provided that the Gironde region, which was the first and most heavily infested centre, did not act as a reservoir for the origin of fresh swarms of adults. The danger of transport of the insects by the waterways and railways, as well as by flight, must be borne in mind ; inspection and prompt action are the two essential measures to ensure success ; the discovery of fresh infestations that were undoubtedly in evidence more than a year previously demonstrates a regrettable negligence in reporting the presence of the pest.

RATKE (R.). **Von den Lebensgewohnheiten der Blutlaus.** [On the Bionomics of the Woolly Aphis.]—*Nachr. Schädlingsbekämpfung*, ii, no. 2, pp. 107-110, 2 figs. Leverkusen b. Köln, May 1927. [Recd. September 1927.]

This is a popular account of the life-history of the woolly aphid [*Eriosoma lanigerum*] in Germany. A proprietary spray is recommended.

WHEELER (W. M.). **The Ants of the Canary Islands.**—*Proc. Amer. Acad. Arts & Sci.*, lxii, no. 3, pp. 93-120, 3 pls., 30 refs. Boston, Mass., April 1927.

The only ant of economic importance in the Canary Islands is *Iridomyrmex humilis*, Mayr, which is now a serious menace to banana cultivation. The ant fosters Coccids on the plants and transports their young from plant to plant. It has thus a constant food-supply and can remain active and multiply in sub-tropical countries during the long summer drought, while other ants and most other insects are inactive or aestivating. Its activities are most conspicuous during the dry season, when it nests in the earth of the plantations. During the wet season it moves its brood up under the leaf-bases of the banana plants and lives in close contact with the Coccids. It is not found at a greater elevation than about 1,000 ft. It exterminates all other ants in its neighbourhood.

PETCH (T.). **Studies in Entomogenous Fungi.** ix. *Aegerita*; x. *Verticillium* spp.; xi. *Empusa lecanii*, Zimm.—*Trans. Brit. Myc. Soc.*, xi, pts. 1-4, pp. 50-66, 1 pl., 1 fig., 9 refs., pp. 251-254, 4 figs., pp. 254-258, 6 figs. Cambridge, August & December 1926. [Recd. August 1927.]

A brown fungus was found attacking *Dialeurodes* (*Aleurodes*) *citri*, R. & H., on oranges in Florida in 1896, and was later named *Aegerita webberi*. It forms a brown pustule over the insect and ultimately entirely conceals it, but the pustule can easily be detached from the leaf, when the insect is found beneath it. This fungus has no relation to *Meliola* (sooty mould), and it is doubtful whether it can be regarded as a true conidial fructification. Similar forms are described from Ceylon (where the fungus also attacks *Aspidiotus*) and from an unidentified scale in New Zealand, and although, from the characters of the stromata, it would seem that all three are different species, the sporodochia in each are identical and they must therefore all be referred to *A. webberi* on the available evidence. It has been claimed that successful propagation of the fungus is obtained by grinding up in water leaves bearing the fungus and spraying the mixture on to trees infested with Aleurodids. This argues a ready germination of the sporodochia, or a rapid growth from fragments of the stroma, but failure to obtain pure cultures from the sporodochia or stromata throws considerable doubt on the validity of the method. *Septobasidium lanosum* was described in 1924 as parasitic on Coccids on *Citrus decumana* (pomelo) in Tonkin; there is considerable resemblance between the conidial forms of this fungus, which are described, and the sporodochia of *A. webberi*, suggesting the possibility that the latter may prove to be a form of *Septobasidium*. Certain fungi parasitic on *A. webberi* are discussed.

A species of *Verticillium*, which was found in Florida to be parasitic on Aleurodids and Coccids, was identified as *V. heterocladium*, which was originally found on *Coccus (Lecanium) hesperidum* on lemon leaves in Italy. The author discusses the differences between the Florida form and *V. heterocladium*, and does not think they can possibly be the same species, but has not yet had the opportunity to study the European form.

In 1901, Zimmermann described as *Empusa lecanii* a fungus that he had observed attacking *Coccus (Lecanium) viridis* in Java, explaining that he placed it in the genus *Empusa*, although certain characters were exceptional for that genus. A fungus was subsequently recorded from various parts of India and Ceylon on the same host. Examination of these forms revealed the fact that the fungus present was not an *Empusa*, though the author thinks that it is probably identical with the one described by Zimmermann as *E. lecanii*.

PETCH (T.). **Entomogenous Fungi. Additions and Corrections, ii.** — *Trans. Brit. Myc. Soc.*, xi, pt. 3-4, pp. 258-266, 9 figs. Cambridge, December 1926. [Recd. August 1927.]

Notes are given on various fungi, including descriptions of the following new species from Ceylon: *Rhinotrichum album*, on *Saissetia (Lecanium) hemisphaerica*, Targ.; *Coremium pulcherrimum*, on *S. (L.) nigra*, Nietn.; *C. breve*, on *Lecanium* sp.; *Stilbum (Stilbella) coccorum*, on *Fiorinia juniperi*, Leon.; and *Hirsutella nodulosa*, on larva of *Zeuzera coffeae*, Nietn. Other species dealt with are parasitic on less important insects or on other entomogenous fungi. A fungus attacking *Plathyphenia scabra*, F., and *Anticarsia gemmatalis*, Hb., in the United States has been recorded as *Botrytis rileyi*, but from the description and from the fact that a fungus attacking *A. gemmatalis* in Florida proved to be *Spicaria prasina*, the author considers that this fungus is probably a species of *Spicaria*.

DE HAAN (J. T.). **Verslag over de werkzaamheden van het Proefstation Midden-Java gedurende het jaar 1926.** [Report on the Work of the Central Java Experiment Station for 1926.]—*Meded. Proefst. Midden-Java*, no. 44, pp. 16-30. Salatiga, 1927.

Among the pests recorded in 1926 *Araecerus [fasciculatus]* reduced the seed-crop of the shade-plant, *Tephrosia candida*, and *Helopeltis* and *Acrocerops (Zarathra) cramerella* infested cacao. The coffee berry borer [*Stephanoderes hampei*] did little harm to coffee. The breeding of its parasite [*Prorops nasuta*] was continued, but its numbers were not maintained. The twig-borer [*Xyleborus coffeae*] gave rise to some anxiety; all infested, pruned twigs should be left in the coffee plantations to enable its parasites to develop. The leaves of kapok were attacked by the Limacodids, *Belippa* sp. and *Setora* sp., and the seeds by *Mudaria [variabilis]*.

MUGGERIDGE (J.). **The European Earwig: Its Habits and Control. Some recent experimental Work in New Zealand.**—*N.Z. Jl. Agric.*, xxxiv, no. 6, pp. 395-401, 4 figs., 2 refs. Wellington, N.Z., 20th June 1927.

The European earwig, *Forficula auricularia*, L., has assumed considerable economic importance during the last few years in New

Zealand, particularly as a pest of fruit. Its life-history in New Zealand, which differs little from that in other countries, is briefly described. Though *F. auricularia* is reputed to be a natural enemy of the codling moth [*Cydia pomonella*, L.], it was observed that during the past season, where the earwig infestation was heaviest, *C. pomonella* was more prevalent than for some years.

Laboratory tests indicated that the most successful poison bait was one consisting of 3 oz. bran soaked for 10 days in a solution of 1 gm. white arsenic in 100 cc. water and 10 cc. molasses; this bait killed 100 per cent. of the earwigs in 2½ days. Baits soaked for less than 10 days were not so effective. Sodium fluoride proved less toxic, a similar bait containing 1 gm. of this poison killing only 85 per cent. in 10 days (but cf. *R.A.E.*, A, xi, 485). It is more soluble than white arsenic and easier to incorporate in a poison bait, but much more expensive. Paris green thoroughly mixed with crumbled stale bread at the rate of 1 oz. to 1 lb. and moistened with water killed 50 per cent. of the earwigs confined in a box in 24 hours and 80 per cent. in 48 hours, but this formula is too costly for use on large areas. A certain amount of control may be secured with traps, and trees can be protected by sticky bands round the trunks. A ring of sodium fluosilicate placed on the ground round the base of a tree proved ineffective as a barrier, as the earwigs were able to cross it after the surface had been hardened by rain. Calcium cyanide dust can be effectively used as a fumigant for packing cases, or for dusting on to cabbages, in which large numbers of earwigs are frequently concealed, and proves fatal within one or two minutes of application.

No traces of earwigs were found in the alimentary tracts of hedgehogs that had been introduced into one district for their control, but the examination of the excreta of the brown owl (*Athene nocturna*) showed the remains of a large number.

FRENCH, jr. (C.) & LEVICK (G. T.). **The Codling Moth, *Cydia (Carposapsa) pomonella*, Linn., its Life History and Control.**—*Jl. Dept. Agric. Victoria*, xxv, pt. 6, pp. 351–358, 3 figs. Melbourne, June 1927.

It is estimated that the loss to the fruit-growing industry in Victoria caused by *Cydia pomonella*, L., in an average year, varies in the different districts from 2 to 20 per cent. of the crop according to climatic conditions, with an approximate average of 5 per cent. for the whole State. This loss would amount to over £25,000 per annum, apart from expenditure on remedial measures.

The winter is passed as a full-grown larva in the cocoon or occasionally as a pupa. In the spring the first moths appear about the time the petals of the apple blossom are falling; and the eggs, which are laid a few days later, on the fruit or on the leaves and twigs, hatch in about a week, though definite records for Victoria are not available. Even the larvae that hatch on the fruit do not enter it directly, but move about till they find a suitable point of entry (usually the calyx in the case of the first brood). The cocoons are mostly found among the rough bark on the tree, seldom in the soil, and pupation lasts about ten days in summer. There appear to be two broods a year.

The remedial measures recommended in Australia and elsewhere are reviewed; recent experiments have indicated that 4 lb. powdered lead arsenate to 80 gals. water for the calyx spray is better than the usual strength of  $2\frac{1}{2}$  lb.

POPE (W. T.). **Banana Culture in Hawaii.**—*Hawaii Agric. Expt. Sta.*, Bull. 55, 48 pp., 17 pls., 20 refs. Washington, D.C., December 1926. [Recd. August 1927.]

In this bulletin on the cultivation of bananas the insect pests are briefly dealt with. *Adoretus umbrosus*, E. (Japanese beetle) is occasionally found feeding on the foliage. *Rhabdocnemis* (*Sphenophorus*) *obscura*, Boisd. (sugar-cane borer) is no longer a pest of the banana plant, since it has been almost exterminated by the Tachinid, *Ceromasia sphenophori*, Vill. The mealybug, *Pseudococcus brevipes*, Ckll. (*bromeliae*, auct.) is found in masses between the fruits in some localities during the drier months of the year, and although it does not seriously retard their development, it renders them unsightly. It may be removed by washing the severed bunches with a stream of water from a force pump. It also collects on suckers, and under the leaves and on the inner side of the outer sheaths, from which it sucks the sap, seriously retarding their growth. It may be controlled by spraying with an oil emulsion. The report of the possible infestation of the two thin-skinned native varieties of banana by *Ceratitis capitata*, Wied. (Mediterranean fruit-fly) [*R.A.E.*, A, iv, 134] has probably led to the belief that all Hawaiian varieties are attacked. The author therefore points out that although investigations have been carried out since 1910, no evidence has been obtained that commercial varieties are susceptible to attack. The two varieties mentioned are rarely eaten raw or shipped from the islands; they are scarce and quite distinct from both the ordinary cooking bananas and the commercial varieties. A number of experiments carried out to determine why bananas were immune failed to confirm the belief that this fruit was protected by the presence of other, more attractive, plants. When attempts failed to force the fly to oviposit in bananas that were sufficiently mature to ship, freshly laid eggs were taken from another kind of fruit and placed in incisions in the bananas, but although some of these eggs hatched, the larvae died before entering the pulp. During 13 years' inspection of bananas for shipment, no infestation by *C. capitata* has been discovered among either green or ripe bananas grown under normal field conditions [*cf. R.A.E.*, A, xiv, 152].

BOVING (A. G.). U.S. Bur. Ent. **On the Classification of the Mylabridae Larvae (Coleoptera: Mylabridae).** *Proc. Ent. Soc. Wash.*, xxix, no. 6, pp. 133-144, 1 pl., 1 fig., 2 refs. Washington, D.C., June 1927.

The larval characters of the BRUCHIDAE (MYLABRIDAE) are discussed and in this connection some views on the affinities of the family are given. Keys to the genera *Pachymerus*, *Spermophagus* and *Bruchus* (*Mylabris*) and to 8 species of the genus *Bruchus* are included,

WHITE (G. F.). U.S. Bur. Ent. **A Protozoan and a Bacterial Disease of *Ephestia kuehniella*, Zell.**—*Proc. Ent. Soc. Wash.*, xxix, no. 6, pp. 147–148. Washington, D.C., June 1927.

A disease caused by a sporozoan has been found to attack the larvae of *Ephestia kuehniella*, Zell. (Mediterranean flour moth). The parasites are ingested with the food, pass through the gut wall and multiply in the fat cells, usually causing the death of the insect in the larval, pupal or adult stage. The disease is very infectious and causes a heavy mortality. Infection with this protozoan is not confined to *E. kuehniella*.

A disease of *E. kuehniella* caused by *Bacillus thuringiensis*, originally described from Germany, has also been encountered in the Washington laboratory. Death usually occurs during the larval stage, the mortality being heaviest in hot weather, at which time it may reach 100 per cent.

GRIFFIN (E. L.), RICHARDSON (C. H.) & BURDETTE (R. C.). U.S. Bur. Ent. **Relation of Size of Oil Drops to Toxicity of Petroleum-oil Emulsions to Aphids.**—*Jl. Agric. Res.*, xxxiv, no. 8, pp. 727–738, 2 figs., 9 refs. Washington, D.C., 15th April 1927. [Recd. August 1927.]

It has been the usual experience that a miscible oil diluted for spraying requires a larger percentage of oil than a lubricating oil emulsion. This discrepancy has probably sometimes resulted from the use of oils lighter and less toxic than the lubricating type. There are no reports available in the literature of experiments with miscible oils and emulsions made from the same petroleum oil. As the main difference between a diluted miscible oil made with cresylic acid and soap and a diluted soap emulsion appears to be the presence of cresylic acid in the former and the difference in the size of the oil drops, it is conceivable that either of these factors might influence the toxicity. Experiments have been made with ten petroleum oils, ranging from a light, volatile oil of low viscosity to a lubricating oil of high viscosity, and representing both the paraffin and naphthene base oils. The properties of these oils are tabulated. The emulsions were prepared by the following methods: the Government method, in which 2 U.S. gals. oil and 1 U.S. gal. water containing 1 U.S. qt. potassium fish-oil soap are heated to incipient boiling and then forced three times through a disk-type spray nozzle at a pressure of 40 lb. per square inch; the cold-mixing process, in which the oil was stirred into the soap in the same proportions as above, and the water then added; a miscible oil made by stirring 8 U.S. fl. oz. cresol into 1 U.S. qt. potassium fish-oil soap and then stirring 2 U.S. gals. oil into the resultant mixture, and adding 5 U.S. pts. water [cf. *R.A.E.*, A, xiv, 454]; and a mechanically mixed emulsion prepared by passing a mixture of approximately 1 part oil and 10 parts water several times through a colloid mill. Each of these emulsions was prepared in duplicate, the one having large droplets and the other small ones. In the Government formula and the cold-mix emulsion the droplets were usually 8–10 microns in diameter, and by passing the emulsion several times through a colloid mill the drops were reduced to about 2 microns. The usual diameter of the drops in the miscible oil was 2 microns or less, an emulsion containing the same ingredients, but having drops of a diameter of 8–10 microns, was prepared by diluting the cold-mix emulsion of soap and

oil with water containing 0.5 per cent. cresol. In the case of the oil and water emulsion the drops were mainly 10 microns in diameter, but after standing for 24 hours it separated into two layers, the lower containing mainly droplets of 2 microns or less in diameter.

The following is taken from the authors' summary:—The emulsions in which the oil droplets were relatively large were decidedly more toxic to *Aphis rumicis*, L., than those in which the droplets were small. The toxicity of the preparations, as correlated with drop size, was not influenced by the physical characteristics of the oil, or the presence or absence of a soap emulsifier or of cresol. When foliage or twigs of plants without foliage are sprayed with emulsions of large drop size, more oil is retained by the plant surface than when they are sprayed with emulsions of small drop size. The following explanation for this is offered. Oil droplets in emulsions and plant surfaces bear negative electrical charges. The droplets in an emulsion of small drop size have a greater charge per unit volume of oil than those in an emulsion of large drop size, because the charge is proportional to the surface. It is believed that plant surfaces repel the droplets in the first type of emulsion with a greater force than those of larger size, and that consequently the electric charges of plant surfaces and oil droplets are a factor in determining the ability of an oil in an emulsion to adhere to plant surfaces. Under conditions of comparable concentration and type of oil, miscible oils are probably less toxic to insects than the ordinary soap-oil emulsions, because they contain smaller oil droplets and the oil therefore adheres to the plant (and no doubt to the insect) less effectively.

CUSHMAN (R. A.). U.S. Bur. Ent. **Three New Hymenopterous Parasites of the Pine Tip Moth, *Rhyacionia frustrana* (Comstock).**—*Jl. Agric. Res.*, xxxiv, no. 8, pp. 739–741, 2 refs. Washington, D.C., 15th April 1927. [Recd. August 1927.]

The new species described are *Campoplex frustranae*, from Virginia, a species that spins its cocoon inside the shattered pupal shell of the host; *Phanerotoma rhyacioniae*, from Louisiana; and *Microbracon gemmaecola*, from Massachusetts and Virginia.

PHILLIPS (W. J.). U.S. Bur. Ent. *Eurytoma parva* (Girault) **Phillips and its Biology as a Parasite of the Wheat Jointworm *Harmolita tritici* (Fitch).**—*Jl. Agric. Res.*, xxxiv, no. 8, pp. 743–758, 2 figs., 8 refs. Washington, D.C., 15th April 1927. [Recd. August 1927.]

This detailed account of the habits of *Eurytoma parva*, Phillips, which includes descriptions of the egg and some of the various larval instars, is the result of both field and laboratory observations. *E. parva* is one of the most important parasites of *Harmolita tritici*, Fitch (wheat jointworm) in Virginia, where it has gradually increased since 1916; it is also apparently increasing in the central States. The breeding methods used in the laboratory are described, and the larvae of the host and parasite, which resemble each other most in the later instars, are compared. *E. parva* may, however, have phytophagous habits, which have perhaps only been acquired recently, and

can develop entirely on plant sap. It causes the same type of injury as its host, but it will not oviposit in stems unless *H. tritici* has already infested them. In Virginia the adults of *E. parva* emerge about the first half of May, depending on weather conditions. The majority of the eggs are probably placed in the cells of the jointworm, but rarely in direct contact with the latter. The larva hatches in 4-5 days and rapidly devours the host larva; if another is within reach, it attacks it also, but otherwise it feeds on the plant sap. When the eggs are laid outside the cell of the host and there is no larva of *H. tritici* in the immediate vicinity, the larva of *E. parva* feeds directly on the plant sap. The larva is full-grown in 24 days, after which it remains in the larval stage in its cell until the following spring. Pupation occurs some time in the latter half of March.

The larvae of *E. parva* are very active and wriggle vigorously at the slightest disturbance; by this means they crush many of the first instar larvae of parasites that attempt to attack them. The parasites found infesting them were *Ditropinotus aureoviridis*, Crawford, *Eupelmus saltator*, Lind., *Eupelmus allyni*, French, and *Homoporus chalcidiphagus*, Walsh.

*Harmolita (Isosoma) inquilina*, Rimsky-Korsakov, which has similar habits to *Eurytoma parva* [R.A.E., A, ii, 471] would probably be placed in the genus *Eurytoma* by American systematists.

VAN LEEUWEN (E. R.). U.S. Bur. Ent. **A Study of the Toxicity of Acid Lead Arsenate on the Japanese Beetle (*Popillia japonica* Newm.).**—*Jl. Agric. Res.*, xxxiv, no. 11, pp. 1043-1047. Washington, D.C., 1st June 1927.

The experiments described were undertaken in order to determine the quantity of arsenic required to kill an adult of *Popillia japonica*, Newm., and the quantity of sprayed foliage it would have to eat to cause death. Dry commercial lead arsenate, containing 32 per cent. by weight of arsenic oxide, was used in six mixtures varying from 1 to 6 lb. in 50 U.S. gals. water. The smallest possible quantity of lime-casein mixture consistent with satisfactory results (3.9 gm. to 3 U.S. gals.) was added to ensure the even distribution of the poison mixture on the foliage. A comparison of the quantities of arsenic per unit area adhering to foliage dipped into mixtures containing various proportions of lead arsenate shows that the increase of arsenic is rather uniform up to and including 3 lb. to 50 U.S. gals. water, but after this it is very slight, which probably accounts for the similarity of the results obtained in the field with either 3 or 4 lb. lead arsenate to 50 U.S. gals. water.

The area of leaf-surface eaten by the beetle tends to decrease as the arsenic content of the leaf-surface increases. The average toxic dose varies from 0.0011 mgm. to 0.0050 mgm. of arsenic oxide ( $As_2O_5$ ) and from 0.0035 mgm. to 0.0156 mgm. of lead arsenate ( $PbHAsO_4$ ). The approximate time from the beginning of the experiment to the first feeding varies from 20 to 28 hours, and to the death of the beetle, from 68 to 88 hours; a small percentage, however, will die within 48 hours. The beetles on the untreated leaves feed for a very much longer period than those on the poisoned leaves and eat about 26 times as much as those fed on leaves treated with 1 lb. lead arsenate to 50 U.S. gals. water.

These results indicate that in the field the beetles may be controlled by lead arsenate before they can do very much damage by feeding on the foliage.

MORGAN (A. C.) & CHAMBERLIN (F. S.). **The Tobacco Budworm and its Control in the Georgia and Florida Tobacco-growing Region.**—*U.S. Dept. Agric., Farmers' Bull.* 1531, 9 pp., 10 figs. Washington, D.C., June 1927.

The greater part of the information contained in this bulletin on *Heliothis virescens*, F. (tobacco budworm) has already been noticed [*R.A.E.*, A, vi, 213; xi, 311; xiv, 536]. Its most important parasite is *Cardiochiles nigriceps*, Vier. [A, xiv, 528] [previously recorded as *Toxoneura* sp.]. The life-cycle of the first generation of *H. virescens* occupies about 46 days, while the later ones may occupy about 33 days. The author points out that only a small amount of the lead arsenate and maize meal poison mixture [A, vi, 214] should be applied to each bud, since excessive quantities may cause some injury to tender leaves, especially those of shade-grown wrapper tobacco, in wet weather. When the growth of cigar wrapper and filler tobacco is much retarded by severe drought, one application of poison mixture a week may be sufficient and an excessive accumulation of poison on the plant will be avoided. The applications must be continued until the tobacco is topped. In the case of bright or cigarette tobacco, 3-5 applications of the poison mixture at intervals of about a week during the early part of the season will usually give all the protection that is necessary for this type of tobacco. Treatment should be commenced when examination of the buds indicates that the small caterpillars are numerous.

[**Entomological Work of the Year.**]—*Rept. California Agric. Expt. Sta.* 1925-26, pp. 49-52 & 64-69. Berkeley, Cal., 1926. [Recd. July 1927.]

Some of the information contained in this report has been noticed from other sources. A series of comparative tests of liquid hydrocyanic acid and calcium cyanide,  $\text{Ca}(\text{CN}_2)$ , in citrus fumigation showed less leakage through the tent when the gas was derived from the powder than when it was derived from liquid HCN [*cf.* *R.A.E.*, A, xv, 263]. An investigation of citrus Aphids has led to the conclusion that *Aphis gossypii*, Glov., and *A. pomi*, DeG. (*spiraecola*, Patch) are distinct, both being widely distributed over the citrus area.

Highly refined white lubricating oil emulsions proved very effective against all stages of *Tetranychus telarius*, L., in orchards, where the spray was applied as soon as the infestation appeared and came into direct contact with the mites.

Further studies of the mealy plum aphid [*Hyalopterus arundinis*, F.] indicate that the winter is passed in the egg stage on the trees [*cf.* *R.A.E.*, A, xiv, 406], there being no evidence that the late autumn adults hibernate on cat-tails [*Typha*] and reeds [*Phragmites*]. Soap sprays gave as good control at a strength of 4 lb. soap to 100 U.S. gals. water as at stronger concentrations, without scorching, which occurred in one case where a spray of 8 lb. to 100 U.S. gals. was used.

Arsenical and fluosilicate dusts proved equally satisfactory for the control of cucumber beetles [*Diabrotica*], but hydrated lime used as a carrier tended to stunt the plants, gypsum proving more satisfactory.

A spray containing pyridine extract proved the most satisfactory treatment against the corn ear worm [*Heliothis obsoleta*, F.], three or four applications being necessary.

**Insects Pests.**—39th Ann. Rept. S. Carolina Expt. Sta., 1925-26, pp. 31-41, 4 figs. Clemson College, S.C., December 1926. [Recd. August 1927.]

Pests attacking cotton in South Carolina in 1925-26 included the boll weevil [*Anthonomus grandis*, Boh.], which was less destructive than in the previous year; the cotton flea-hopper [*Psallus seriatus*, Reut.], which caused considerable injury [R.A.E., A, xv, 404]; and the bollworm [*Heliothis obsoleta*, F.], which migrated from freshly cut lucerne stubble to cotton. On tomatos most of the eggs of *H. obsoleta* were attacked by a parasite that effectively checked it. Of a number of other insects observed on cotton, only the cotton leaf worm [*Alabama argillacea*, Hb.] caused serious trouble. Migrants appeared in August in South Carolina, where the larvae caused considerable injury to cotton owing to the lateness of the crop, though where warning was received and precautionary measures taken little damage resulted.

Maize was attacked by the weevil, *Sphenophorus maidis*, Chitt., which appeared in April and May when the earliest plantings were just above ground and killed large numbers of young plants, decreasing in July and disappearing entirely by the end of August. Mating was observed about 13th May and eggs were first found on 25th May. Examination of a field in which the bulk of the infestation occurred on the side adjoining the site of a maize crop of the previous year suggested crop rotation as one means of lessening the damage. In the laboratory the first eggs were laid on 1st June and the last on 11th September; they hatched in rather less than 6 days, the largest number laid by one female being 189 and the average 43. One pair of beetles lived nearly a year in confinement. The average length of the larval stage was 48 days and of the pupal stage about 9 days, the average time taken for development from egg to adult being 63 days. In cage tests with calcium arsenate and [? sodium] fluosilicate, both pure and mixed with an equal quantity of lime, the lime and fluosilicate mixture gave the best results. In field plots in which the bases of the plants were dusted with this mixture, 19 per cent. of the plants were killed by the attack of the weevil as compared with 26 per cent. in untreated plots. Plots planted about 15th June showed only 15 per cent. infestation, while plots planted earlier showed 62 per cent., thus indicating that late planting may possibly avoid damage. Another closely related species occurs in South Carolina, particularly on low land, but is not apparently of importance.

In 1926 the Mexican bean beetle [*Epilachna corrupta*, Muls.] was less destructive than usual on account of weather conditions [R.A.E., A, xv, 401].

The native persimmon [*Diospyros virginiana*] is of some importance in South Carolina as a food-plant of insects injurious to cultivated trees. Pecans are often seriously damaged by a twig girdler [*Oncideres cingulatus*, Say], which breeds freely in *D. virginiana* and in native hickory, and considerable injury is done to the young leaves of *D. virginiana* and the Japanese persimmon [*D. kaki*] by the persimmon psylla [*Trioza diospyri*, Ashm.].

MCDANIEL (E.). **Clothes-moths and Carpet-beetles.**—*Michigan Agric. Expt. Sta., Circ. Bull.* 104, 20 pp., 3 refs. East Lansing, Michigan, April 1927. [Recd. August 1927.]

This is a popular account of the clothes moths, *Tineola biselliella*, Humm., which is the common species in Michigan, *T. pellionella*, L., and *Trichographa tapetzella*, L., which has never been recorded from Michigan; and the carpet beetles, *Attagenus piceus*, Ol., *Anthrenus scrophulariae*, L., *A. verbasci*, L., and *A. fasciatus*, L., which last has only recently been introduced into the United States from Europe and has not yet been recorded from Michigan. The control measures used against these pests are described, and a detailed account is given of the methods employed in fumigating with hydrocyanic acid gas, carbon bisulphide, carbon tetrachloride and sulphur.

LYLE (C.). **Cutworm Control on Overflowed Land.**—*Qtrly. Bull. State Pl. Bd. Mississippi*, vii, no. 1, pp. 1-3. A. & M. College, Miss., April 1927. [Recd. August 1927.]

From past experience, it is thought most probable that the flooded areas of Mississippi will suffer severe damage from cutworms, the adults of which seem to be attracted for oviposition to rank grass and damp soil, while their natural enemies will doubtless have been drowned. The most destructive species generally found on flooded lands is *Laphygma frugiperda*, S. & A., which passes the winter in the extreme southern part of the cotton belt, the moths flying northward in the spring, and each successive generation extending further north. As soon as adults and larvae are observed in southern Mississippi, the campaign against them will begin, and they may be expected in the Delta region 4 or 5 weeks later. Light traps should be used to catch the adults at night. Grasses, which are the natural food-plants, should be examined daily for eggs, and as soon as any are seen, watch should be kept for the larvae and poison bait promptly applied. For this, 50 lb. wheat bran or shorts should be thoroughly mixed with 1 lb. Paris green or sodium fluosilicate, then gradually moistened with water and again mixed; on heavily infested areas from 15 to 20 lb. dry weight should be applied to the acre. On patches of grass, spraying with 2 lb. Paris green to 50 U.S. gals. water may be substituted for poison bait.

LYLE (C.). **Termites—A serious Pest in Buildings.**—*Qtrly. Bull. State Pl. Bd. Mississippi*, vii, no. 1, pp. 11-16, 3 figs. A. & M. College, Miss., April 1927. [Recd. August 1927.]

Serious damage to buildings is caused in several localities of Mississippi by termites, of which the commonest is *Reticulitermes flavipes*, Koll., which is a subterranean species, as are all those recorded in the State, though *Cryptotermes brevis*, Wlk., which is not subterranean, may also be found, as it has been introduced into Florida and is known to occur in New Orleans. The usual methods of dealing with termites are recommended, the most important measure in buildings being to cut off the connection of the termites with the ground, for *R. flavipes* will soon die if it cannot obtain the necessary moisture from the ground or from other sources. Termites are always more prevalent in woody

soil, such as newly cleared land, and trees, particularly pecans, or growing nursery stock should not be planted in such land until two or three crops have been produced on it. Artificial fertilisers instead of manure are recommended on land where termites have been troublesome.

**The Carrot Beetle, *Ligyris gibbosus*, DeG.**—*Qtrly. Bull. State Pl. Bd. Mississippi*, vii, no. 1, p. 19. A. & M. College, Miss., April 1927: [Recd. August 1927.]

Both *Ligyris gibbosus*, DeG. (carrot beetle) and the allied *L. (Euthcola) rugiceps*, Lec. (rough-headed corn-stalk beetle) were very abundant in Mississippi in 1926, the beetles feeding chiefly below the surface of the ground [R.A.E., A, xiii, 26]. *L. rugiceps* feeds mainly on graminaceous plants, *L. gibbosus* being a general feeder. The adults pass the winter in the soil and emerge in the spring, remaining in the fields throughout the growing season. The eggs are laid in the soil and hatch in from 1 to 3 weeks. When mature, the larvae pupate in the soil, the adults emerging 2 or 3 weeks later. There is probably only one generation in a year. Keeping down the weeds on which these insects feed is generally sufficient to hold them in check, and they apparently cause very little injury to cultivated crops.

**Quarantine on account of the Thurberia Weevil. Notice of Quarantine no. 61 (revised), with Supplemental Rules and Regulations (revised).**—*U.S. Dept. Agric., Fed. Hortic. Bd.*, 5 pp., 1 map. Washington, D.C., 1st August 1927.

The areas in Arizona quarantined on account of *Anthonomus grandis thurberiae*, Pierce, by Quarantine no. 61 [R.A.E., A, xiv, 628], which is superseded by this revision, are extended owing to further infestation, and, in addition to the disinfection of cotton lint moved interstate, its compression is also required.

PLATH (O. E.). *Psithyrus laboriosus*, an unwelcome Guest in the Hives of *Apis mellifica*.—*Bull. Brooklyn Ent. Soc.*, xxii, no. 3, pp. 121–125, 2 figs., 2 refs. Lancaster, Pa., 25th July 1927.

As the result of observations made in Massachusetts since July 1922, the author concludes that *Psithyrus laboriosus*, F., and other members of this genus must be considered minor enemies of the hive-bee, *Apis mellifica*, L.

The genus *Psithyrus*, which closely resembles the genus *Bombus* (*Bremus*), may be distinguished from it by the absence of corbiculae in the female. Having thus no apparatus for collecting pollen, the female is unable to found a colony and oviposits in the nests of other bees, including *A. mellifica*, which rear the larvae, their own being destroyed by the intruders. Females of *Psithyrus*, however, meet with opposition when they endeavour to enter hives or nests, and are often driven off and killed by the bees inhabiting them.

SMITH (R. C.). **Observations on *Euplectrus platyhypenae*, How. (Chalcidae) a Parasite of Noctuid Larvae.**—*Bull. Brooklyn Ent. Soc.*, xxii, no. 3, pp. 128–134, 1 pl., 8 refs. Lancaster, Pa., 25th July 1927.

Early in June 1926 *Lycophotia margaritosa*, Haw. (variegated cut-worm) was very plentiful in Kansas, and some damage was expected.

The outbreak was, however, brought to an end by the prompt action of parasites, of which the chief was *Euplectrus platyhyphenae*, How. This Chalcid was also taken in smaller numbers from *Platyphena scabra*, F. (green clover worm), *Caenurgia erectea*, Cram. (forage looper), *Phytometra (Plusia) simplex*, Gn. (celery looper) and a larva closely resembling *Heliothis obsoleta*, F. (corn earworm). During the latter part of June and early July an average of 20 per cent. of the larvae collected were parasitised by it.

The stages of the parasite are described in detail. The eggs are deposited in batches, usually on the dorsum of the thorax of the host larva, the entire life of the larvae being spent outside the host, on whose exuding body-fluids they feed. Each larva in the first instar remains attached to the host by its eggshell, subsequent instars being attached to the eggshells by their exuvia. The larval stage lasts from 4 to 6 days, and there are at least two moults. The larvae hardly move at all and could not be successfully transferred to unparasitised larvae. About a day after spinning a cocoon the parasite enters the pupal stage, which lasts from 4 to 7 days. The longest period of survival of the adults was a little over two weeks.

Oviposition was not observed, but the adults were seen to alight for this purpose on the thorax of the host larva, where they are out of its reach, remaining attached in spite of the almost violent motions of the host to dislodge them. It is presumed that the female does not relax its hold until all the eggs are deposited. All parasitised host larvae were taken from lucerne plants, none being found under soil or rubbish in the fields, a common hiding-place during the day for *L. margaritosa*. The parasitised larvae refused to eat after the parasites hatched, and died a short time after the latter began to spin. All endeavours to induce parasitism with reared adults failed, nor were the adults observed on any kind of larvae during the remainder of the season, having entirely disappeared by August in places where they had been abundant in early July. As *E. platyhyphenae* has been reared in Texas in October, November, December, March and April, its rare occurrence in Kansas may be explained by that State proving to be the northern limit of its range.

**Yearbook of Agriculture 1926.**—8vo, xxi+1298 pp., 270 figs. Washington, D.C., U.S. Dept. Agric., 1927.

The aim of this Yearbook is to review the entire agricultural situation existing in the United States at the present time, and the papers contained in it therefore give a broad outline of their subjects. In general, those dealing with pests give a brief history of the insect and the measures taken for its control.

The following articles are of entomological interest : Alfalfa Weevil [*Hypera variabilis*, Hbst.] Control Methods, by G. I. Reeves ; Bark Beetles [*Dendroctonus*] and Timber Conservation, by J. M. Miller, in which the value of pine stumpage killed annually by these beetles is estimated to average about £3,000,000 ; Citrus Aphid [*Aphis pomi*, DeG.]—a New Pest in Florida, by A. C. Baker ; Corn Borer [*Pyrausta nubilalis*, Hb.] has invaded Corn States, by W. R. Walton ; Cucumber Mosaic and how to Control It, by S. P. Doolittle ; Furniture Destruction by Insects, by E. A. Back and R. T. Cotton ; Japanese Beetle [*Popillia japonica*, Newm.] Control, by L. B. Smith ; Moths—Preventing Their Depredations, by A. F. Burgess, which deals with the history of

the gipsy moth [*Porthetria dispar*, L.] and the brown-tail moth [*Nygmia phaeorrhoea*, Don.]; Pink Bollworm [*Platyedra gossypiella*, Saund.] and Measures to Exclude It, by E. R. Sasser; Pyrethrum Powder as Insecticide, by C. C. McDonnell; Termites Cause Modifications in Building Codes, by T. E. Snyder, in which the following formula is given for making mortar, 1 part Portland cement to 3 parts sand free from organic impurities (no grains to be too coarse to pass through a no. 10 sieve) to which may be added 10 per cent. by weight of hydrated lime.

FLINT (W. P.). **The Control of Household Insects.**—*Illinois Agric. Expt. Sta.*, Circ. 257, 28 pp., 15 figs. Urbana, Ill., April 1922, revised May 1926. [Recd. August 1927.]

This is a revision of an earlier circular [*R.A.E.*, A, xi, 179].

SIMMONS (P.). **The Ability of the Larva of the Cheese Skipper, *Piophilha casei*, Linn., to endure unfavourable Conditions.**—*Jl. Wash. Acad. Sci.*, xvii, no. 15, pp. 403-404. Baltimore, Md., 19th September 1927.

The following is substantially the author's abstract. The unusual hardness of the larvae of *Piophilha casei*, L., is shown by their ability to withstand starvation, low or high temperatures, and immersion in many liquids that would be promptly fatal to most insects. The usual duration of larval life in hot weather is 5-6 days, but when proper food is lacking the larval stage may last for as many months. Larvae were found to live at a temperature of 45-50° F. for a maximum of 7 months. They withstood 32° F. for three months. Half-grown larvae lived for 64½ hours at 5° F. Some larvae recovered after exposure to 122-124° F. for 4 hours. When immersed in water at a temperature of 129° F., larvae survived about 2 minutes. Several European workers have conducted experiments with liquids, such as 95 per cent. alcohol, ether, formaldehyde, turpentine, petroleum, carbon bisulphide and xylol, and larvae prove to be surprisingly resistant to immersion in these reagents. Larvae buried in pyrethrum powder pupated in it, and others pupated after immersion for over 3 hours in petrol.

YOUNG (P. A.). **Transmission of Potato Witches' Broom to Tomatoes and Potatoes.**—*Science*, lxvi, no. 1709, pp. 304-306, 2 refs. New York, N.Y., 30th September 1927

In the course of experiments on the transmission of potato witches' broom to tomatoes and potatoes no evidence of transmission of the disease was seen when Coccids, colonised on potatoes severely affected with the disease, were transferred to healthy potato and tomato plants. All attempts to transmit the disease by Aphids also failed.

FROST (S. W.). **Notes on the Life-history of the Four-banded Leaf-roller, *Eulia quadrifasciana*, Fern. (Lepid.)**—*Canad. Ent.*, lix, no. 7, pp. 149-152, 1 fig., 8 refs. Orillia, Ont., July 1927.

The distribution of *Eulia quadrifasciana*, Fern. (four-banded leaf-roller) is discussed, and observations on its life-history made in 1922 and 1923 in Pennsylvania are recorded. It is apparently common

throughout the north-eastern United States, and it occurs also in Canada. In its habits and early stages it closely resembles *E. velutinana*, Wlk. [R.A.E., A, xv, 74]. The larvae, particularly of the first and second generations, feed largely on the succulent foliage and growing tips of apple; they also attack the fruit, eating shallow cavities in the surface. They feed more openly than *E. velutinana*, spin less silk, and eat through the lower epidermis when feeding from the upper surface of the leaf.

Hibernation occurs in the pupal stage beneath the bark of apple or among dried leaves or other litter on the ground, the adults emerging during March or early April and laying their eggs on the trunks and larger branches of apple trees. The larvae of the first generation pupate towards the end of May, the pupal stage lasting from 11 to 14 days. A few days after emergence the adults mate and oviposit, the eggs of the second generation hatching in 7-10 days in the latter part of June. Individual adults lived for only 6 or 7 days, the males dying sooner than the females. Fourteen females laid 828 eggs, the maximum number laid by one individual being 146. Larvae of the second generation, hatching between 22nd and 26th June and reared in the laboratory, matured in from 28 to 45 days. The average pupal period of this generation in the insectary was 9.3 days. The adults emerged from 2nd August until after 2nd September, those appearing during August producing a third generation, although it is doubtful whether the later ones would do so. Adults were seen flying almost continually in the orchard from June to August, sugar baits hung in pails in the trees attracting large numbers of this species and of *E. velutinana*. Full-grown larvae and pupae found in the orchard on 9th August were apparently the first to hibernate.

FLINT (W. P.), HACKLEMAN (J. C.) & BAUER (F. C.). **Learning to live with the European Corn Borer.**—*Illinois Agric. Expt. Sta., Circ.* 313, 15 pp., 10 figs. Urbana, Ill., January 1927. [Recd. August 1927.]

The European corn borer [*Pyrausta nubilalis*, Hb.] is now established over an area of more than 100,000 square miles in North America. Since 1925 it has spread for a further distance of 50 to 75 miles, and it is now found in the southern counties of Michigan, in six counties in Indiana, and has extended its range in Ohio, Pennsylvania and western New York. A single individual has also been observed in Illinois. In view of the seriousness of the situation, the usual cultural and protective measures are advocated, and suggestions for various rotations of crops suitable for growing in the districts affected are given.

JOHNSON (B. W.). **Dusting saves Residue Troubles.**—*Better Fruit*, xxi, no. 8, p. 10. Portland, Oregon, February 1927. [Recd. August 1927.]

Dusting of 100 acres of four varieties of apple in Oregon gave as good results in the control of codling moth [*Cydia pomonella*, L.] as liquid sprays applied to 200 acres, and at no greater expense. The trouble and delay of cleaning fruit for arsenical residues may be avoided by the substitution of dust for the July and August cover sprays on trees already sprayed earlier in the season. Arsenical residues on dusted fruit never exceeded 50 per cent. of the amount allowed by the British regulations. Two men and a team will cover 3 to 5 acres

an hour with a power duster, and the outfit is inexpensive. The economic advantages of this process are particularly obvious in the case of large acreages.

REGAN (W. S.). **Values of Moth Control Sprays Tested.**—*Better Fruit*, xxi, no. 8, pp. 16-18, 32-33. Portland, Oregon, February 1927. [Recd. Aug. 1927.]

This paper gives a summary of the results of tests and observations mentioned in a previous abstract [*R.A.E.*, A, xv, 430].

Lead arsenate was used in varying dosages to control a moderately severe infestation of the codling moth [*Cydia pomonella*, L.]. Five thorough applications at the rate of 2 lb. to 100 U.S. gals. gave unsatisfactory results; at the rate of 3 lb. and 4 lb. to 100 gals. a proportionately larger number of caterpillars were killed, but there was scarcely enough difference between these two dosages to warrant the use of the larger amount, and the results were not entirely satisfactory. When a casein-lime spreader was used, better average control was obtained with each strength of lead arsenate tested, blotched colouring of the fruit was prevented and the removal of spray residue was less difficult than when lead arsenate was used alone. There was, however, no consistent evidence that more than  $\frac{1}{2}$  lb. of spreader to 100 U.S. gals. gave better results than this amount.

The best results were obtained with a combination of 2-3 lb. lead arsenate and 1-1 $\frac{1}{2}$  U.S. gals. summer oil in 100 U.S. gals. water, and in some of the tests where five applications were made (the last one shortly after the middle of June) more than 98 per cent. of the fruit was free from injury. The cost of the oil is more than compensated for by results. Casein-lime,  $\frac{1}{2}$  lb. to 100 U.S. gals., should be added to this combination to prevent the curdling and blotching of the lead arsenate; the uniform covering that results is comparatively easy to remove by wiping. Tests on apples with four applications of a summer oil alone (1, 1 $\frac{1}{2}$  and 2 per cent.) showed that one or two additional applications would have to be made to obtain results comparable with those of the best lead arsenate or combined lead arsenate and oil sprays. On pears oil alone gave very satisfactory control without producing any of the unfavourable reactions shown by some varieties of apples. Peaches also showed no unfavourable reaction to heavy applications of this oil. The results indicate that the oil kills eggs hit by it or laid on it while the film is fresh, and also acts to some extent as a repellent. The length of time that the ovicidal and repellent action endures after application depends apparently on the strength of the oil and the thoroughness with which it is applied.

The experiments showed that the best results in the control of *C. pomonella* will probably be obtained by a concentrated effort against the first brood, and that by frequent and thorough spraying at intervals of 10 to 15 days this generation can be reduced to a point where applications after the middle of June or 1st July will be unnecessary. In one test with lead arsenate and oil spray, the complete elimination of the first brood was demonstrated with four applications, 12 days apart, completed by 31st May, nearly four months before the fruit was picked. Only 5.8 per cent. of the fruit was injured; no larvae were trapped under bands throughout the season, and infestation only occurred late in the season. In districts where infestation is usually heavy, the frequent and thorough application of sprays to keep the

fruit and foliage continually covered with a protective film seems to offer far greater possibility of success than the adherence to somewhat variable spray dates.

Physiological differences in the varieties of apples, low vitality of the trees, and drought, associated with excessively high temperatures, sometimes caused unfavourable reaction to oil sprays, but supplying ample moisture, avoiding spraying in very hot weather and possibly modifying the type of oil used on susceptible varieties, may partly if not entirely solve this difficulty.

Oil sprays should not follow dormant lime-sulphur until the fruit is set, otherwise excessive falling of young fruit may occur. It was also found that the foliage may be severely scorched if even dilute lime-sulphur is followed too soon by an oil spray. Where the trees are vigorous and well pruned, an interval of a month seems sufficient to avoid this difficulty. It appears that the calyx spray is not necessary in the north-west, where frequent and thorough applications are begun before the first eggs hatch.

The feasibility of controlling the San José scale [*Aspidiotus perniciosus*, Comst.] in summer with an oil spray has been demonstrated [R.A.E., A, xiv, 264]. Good control of the scale has also been obtained by combining 1-1½ per cent. oil with lead arsenate in the cover sprays, as for *C. pomonella*, even when the dormant spray was omitted. This is also effective against mites and Aphids.

Tests were also made to determine the effect of the various treatments on the removal of spray residue by a wiping machine. It was found that in each case where a spreader was used the wiping was facilitated, but in general, wiping proved ineffective in removing arsenate in excess of the tolerated amount. Different kinds of spreader undoubtedly influence the ease with which the arsenic is removed, and certain brands of lead arsenate are more difficult to remove than others.

Ross (W. A.). **The Oriental Peach Moth in Ontario.**—*Canada Dept. Agric.*, Circ. 57, 4 pp., 3 figs. Ottawa, June 1927.

A brief account is given of the distribution, life-history and control of the oriental peach moth [*Cydia molesta*, Busck] in Ontario [R.A.E., A, xv, 69]. Three generations occur in a year. The average percentage of infestation on seven trees examined in 1926 was 58, with a maximum of 71 and a minimum of 48. If damaged peaches are destroyed by burying in pits, they should be covered with oil. All orchard boxes or other containers that have held peaches should be stored in moth-proof buildings from 1st May to mid-July, so that moths overwintering in them will be unable to invade the orchards. At the canning factories all boxes and baskets should be sterilised before being returned to the growers in order to prevent the dissemination of the insect throughout the peach growing areas, and all peach refuse dumped in the open should be covered with oil to destroy the larvae.

**Reglamento de Policia sanitaria agricola y Cuarentenas exteriores**  
**Nums. 1, 2, 3, 4, 5 y 6.** [Regulations of Plant Protection and  
 External Quarantines nos. 1-6.]—*Mexico: Sec. Agric. y Fomento,*  
*Oficina Defensa Agric.*, 38 pp. S. Jacinto, D.F., 1927.

The text is given of the regulations governing plant protection and the enactment of internal and external quarantines referring to plant protection in Mexico.

RICCIO (C.). **Informe del Entomólogo oficial.** [A Report of the Entomologist, Guatemala.]—*Bol. Agric. Guatemala*, vi, no. 7, pp. 297–300, 3 figs. Guatemala, July 1927.

The European corn borer, *Pyrausta nubilalis*, Hb., is a serious pest of maize in Guatemala.

MAY (D. W.). **Germinating Sugar Cane.**—*Porto Rico Agric. Expt. Sta.*, Agric. Notes no. 38, 2 pp. San Juan, P.R., April 1927. [Recd. August 1927.]

Experiments were carried out to determine which of the various solutions used for soaking sugar-cane sets was most effective in producing rapid and vigorous germination and in killing the insect pests, especially *Diatraea saccharalis*, F. (cane borer). The best results were obtained with water alone, or solutions of lime, or lime and magnesium sulphate, soaking the sets for one day.

MARELLI (C. A.). **El gorgojo de los eucaliptos hallado en la Argentina no es la especie originaria de Tasmania** *Gonipterus scutellatus* Gyll. [The Weevil on *Eucalyptus* in Argentina is not the Tasmanian species, *G. scutellatus*.]—*Rev. Mus. La Plata*, xxx, pp. 257–269, 9 refs. Buenos Aires, 17th May 1927.

This is a discussion of the characters distinguishing the weevil attacking *Eucalyptus* in Argentina [*Gonipterus gibberus*, Boisd.; *R.A.E.*, A, xiv, 434; xv, 237, 494] from *G. scutellatus*, Gyll.

BLANCHARD (E. E.). **Aphid Notes. Part V. Argentine Species of the Subtribe Aphidina. Part VI. Argentine Species of the Subtribes Callipterina, Pterochlorina, Lachnina and of the Tribes Eriosomatini and Pemphigini.**—*Physis*, viii, no. 28, pp. 12–22, 5 figs.; no. 30, pp. 324–337, 6 figs. Buenos Aires, 23rd May 1925, 30th November 1926. [Recd. September 1927.]

Part V of this paper continues the section on the Argentine species of the subtribe Aphidina [*R.A.E.*, A, xii, 156]. The species dealt with are: *Brevicoryne brassicae*, L., common on *Brassica* spp., *Raphanus* spp., and spinach (*Spinacia oleracea*); *Cavariella capreae*, F., on *Apium*, *Daucus*, *Carum*, and *Pastinaca* spp.; *Myzus* (*Francoa*) *rosarum*, Kalt., on cultivated roses; *Aphis* (*Rhopalosiphum*) *pseudo-brassicae*, Davis, on *Brassica* spp. (not yet important as a pest of the cultivated turnip in Argentina); *R. sisymbrii*, Del Guer., on *Sisymbrium arnottianum*; and *Toxoptera aurantii*, Boy., on *Citrus* and *Viburnum tinus* (this species and *Aphis gossypii*, Glov., constituting the principal Aphid pests of *Citrus*).

The species dealt with in Part VI are: *Myzocallis querciplatensis*, sp. n., on *Quercus* sp.; *Pterochlorus viminalis*, Boy., on *Salix* sp.; *Dilachnus juniperi*, F., on *Thuja occidentalis*; *D. pineti*, Koch, on *Pinus* spp.; *Eriosoma lanigerum*, Hausm. (the importance of which has been much reduced by the introduction of *Aphelinus mali*, Hald.) on apple; and *Pemphigus populitransversus*, Riley (*canadensis*, Del Guer.), on *Populus canadensis*.

BLANCHARD (E. E.). **Sobre un Tingido nuevo para la Fauna argentina.** [A Tingid new to Argentina.]—*Physis*, viii, no. 30, pp. 361–363, 1 fig. Buenos Aires, 30th November 1926. [Recd. September 1927.]

*Stephanitis pyrioides*, Scott, is recorded from Argentina, having in all probability been imported with azaleas from Belgium.

JACK (R. W.). **Report of the Chief Entomologist for the Year 1926.**—*Rhodesia: Rept. Secy. Dept. Agric. 1926*, pp. 23–27. Salisbury, 1927.

Pests of cotton recorded during 1926 in Southern Rhodesia include *Heliothis obsoleta*, F. (American bollworm), *Earias* sp. (spiny bollworm), *Diparopsis castanea*, Hmps. (red bollworm), *Dysdercus* sp., *Oxycaenus* sp., *Cosmophila flava*, F. (*Anomis fimbriago*, auct.) and general feeders such as cutworms, and surface beetles (Tenebrionids).

Observations have been begun to discover whether lint-staining and premature reddening of foliage, which were the chief troubles connected with the cotton crop during 1925–26, are wholly due to the influence of *Dysdercus* and the Jassid, *Empoasca* (*Chlorita*) *facialis*, Jac., respectively, as has been suggested. *Bacterium malvacearum*, and fungi of the genera *Nematospora*, *Phytophthora*, *Fusarium* and *Alternaria* have been obtained from stained lint.

Though comparative tests show that sweet maize is more attractive to *H. obsoleta* than Salisbury white maize, which apparently affords little protection to cotton when planted at the same time, it is doubtful whether it can be used as an effective trap-crop in Southern Rhodesia, as its growth is poor in the red soil and it also attracts the maize stalk borer, *Busseola* (*Glottula*) *fusca*, Fuller.

Pests of tobacco, which have been rather numerous owing partly to late planting, but also to extended interest in this crop, include Tenebrionids (chiefly *Gonocephalum simplex*, F.), wireworms (*Trachynotus* sp.), *Phthorimaea heliopa*, Low., *Heterodera radicolica*, Greeff, cutworms, crickets and grasshoppers. Tenebrionids of the genus *Zophosis*, which, though hardly so destructive to tobacco and maize as those of the genus *Gonocephalum*, do a considerable amount of damage, were attracted and poisoned by a bait consisting of maize meal and arsenic. Previous efforts to poison these insects with sweetened sodium arsenite solution on green stuff as a carrier failed in the field, although very effective against allied species (*Gonocephalum simplex*, F., and *Emyon tristis*, Fhs.).

Pests of *Citrus* include an unidentified thrips known as the yellow citrus thrips, which has developed into an annual pest, and the fruit caterpillar (*Heliothis obsoleta*), which has been in evidence during the past two seasons. Winter fumigation with calcium cyanide dust appears likely to supersede all other methods for the control of *Chrysomphalus aurantii*, Mask. (California red scale) and *Chrysomphalus* (*Aspidiotus*) *aonidium*, L. (*ficus*, Ashm.) (circular purple scale), this form of fumigant having proved more efficacious than liquid HCN or the gas generated from sodium cyanide by the pot method.

Measures against Aphids and thrips consist of a combined spray of lime-sulphur and nicotine applied at the period of spring growth, followed by a nicotine spray during the flowering period, and a further combined spray after the fruit has set.

Considerable damage was done to maize by an outbreak in various localities of *Laphygma exempta*, Wlk., though cotton was not attacked.

Two consignments of coffee seed from Uganda were found to be infested with *Stephanoderes hampei*, Ferr.

NEWMAN (L. J.). **Army Worms, Cut Worms and Web Worms.**—*Jl. Dept. Agric. W. Australia*, iv, no. 2, pp. 227-239, 15 figs. Perth, W.A., June 1927.

The Noctuids, *Persectania ewingi*, Westw. (army-worm) and *Euxoa radians*, Guen. (*Agrotis munda*, Wlk.), and the Pyralid, *Sclerobia tritalis*, Wlk. (web-worm) are common and destructive in the wheat areas of south-west Australia, while *Euxoa* (*Agrotis*) *infusa*, Boisd. (bugong moth) is numerous in some seasons. The first three insects are briefly described. The eggs of *P. ewingi* are invariably laid on weedy grass-lands or stubble, a single female being capable of laying several hundred eggs, which usually hatch in 8-10 days, though cold weather may delay hatching considerably. The larvae begin to cause injury after the second moult, when after devouring the food immediately available they migrate to the crops nearest at hand. Where weedy land has been turned in and sown after a moth flight, young larvae may occur directly on a growing crop. *P. ewingi* shows a marked preference for wheat and often avoids oats. When fully grown the larvae pupate under clods of earth, etc., or in the soil, often forming a cocoon. Only one brood occurs annually, the pupae formed in September remaining dormant until the following autumn rains.

The eggs of *Sclerobia tritalis* are laid in April and May among grass and hatch in a few days except when delayed by frost. The larvae construct silken tubes in a mat of grass or in the soil at the base of the roots when infesting a crop; they live in the tube during the day and come out at night to feed, cutting off the food and drawing it into their tunnels to consume it. Much is cut down and destroyed that is merely left on the ground, and very little second growth occurs after attack by this pest. Several larvae may develop in one root. *S. tritalis* does not migrate and never causes injury where crops are grown on fallow ground or land broken up before the end of April. Though the larvae can always be found in moist coastal districts, there appears to be only one damaging brood, which generally occurs in August-September.

The eggs of *Euxoa radians* are laid almost anywhere and hatch in from 6 to 8 days. The larvae are night feeders and are generally found hidden in the ground at the base of a plant, where they also pupate, usually in a small cocoon. There are several generations a year, the two periods of greatest damage being spring and autumn.

Parasites of these larvae include a Tachinid and an Ichneumonid of the genus *Ophion*.

Clean culture, early sowing, isolation of the new season's crop from the area cultivated the previous year, and the use of oats as a buffer crop are recommended as preventive measures. If an outbreak occurs, poison baits (formulae for which are given) and trenches to catch the migrating larvae may be used. In constructing the trench the furrow should be thrown up on the side away from the crop, and holes into which the larvae may fall should be sunk at intervals of 30 to 40 ft. Spraying with lead arsenate is also effective. Large numbers of army-worms can be destroyed by rollers when they travel over hard smooth surfaces, such as roads.

NEWMAN (L. J.). **Fruit-fly** (*Ceratitis capitata*).—*Jl. Dept. Agric. W. Australia*, iv, no. 2, p. 306, 1 fig. Perth, W.A., June 1927.

In a test of the effectiveness of traps as an adjunct to foliage baiting in the control of *Ceratitis capitata*, Wied., carried out from the middle of April to the middle of May on five orange trees, in each of which two tins were placed, 15,000 flies were captured. The bait used has already been noticed [*R.A.E.*, A, xv, 212]. The importance of continuing trapping and foliage baiting throughout the winter and spring whenever weather conditions permit is emphasised.

TOTHILL (J. D.). **Progress Report of the Coconut Committee**.—*Fiji: Legis. Council*, Paper no. 38 of 1927, 4 pp. [Suva] 31st May 1927. [Recd. August 1927.]

Since the publication of the last report on *Levuana iridescens* [*R.A.E.*, A, xiv, 431] no new outbreaks have been reported. The Tachinid parasite, *Ptychomyia [remota]*, has now spread over all parts of Fiji that are subject to attacks of the moth, and it is known, both there and elsewhere, to be able to subsist on other hosts. Eighteen colonies of the predacious Clerid, *Callimerus [arcufer]* have been liberated. Four indigenous species of ants have been observed to be predacious on various stages of the moth, and the mite, *Pediculoides ventricosus*, attacks the pupae. Further parasites introduced from Java are an undetermined Proctotrupid, which attacks the larvae, and *Trichogrammatoidea nana*, parasitic on the eggs. A method has been devised for breeding *Apanteles artonae* in captivity, and it can be introduced from Java at any time if necessary. There has been heavy mortality among very young larvae of *L. iridescens*, possibly owing to some unfavourable climatic influence at a critical period of their development. Lead arsenate spray, when applied to coconut leaves with a power machine, apparently remains until the leaf falls from the tree. The situation with regard to *L. iridescens* is at present considered sufficiently satisfactory for the campaign to be brought to a close if no further developments occur.

A study has been made of the natural enemies of *Aspidiotus destructor* (coconut scale) occurring in Java, and some have been introduced into Fiji. Successful introductions have been made of an unidentified Chalcid parasitic on the second or third stage females only, a predacious thrips [*Aleurodothrips fasciapennis*!], and an unidentified Coccinellid, both of which attack all stages of the scale. Besides these are a Chalcid, probably *Comperiella bifasciata*, which attacks only third stage females, and two others that are indistinguishable from *Aphelinus chrysomphali* and *Aspidiotiphagus citrinus*, already imported into Fiji from Tahiti. The last two have probably become established. The three most successful species are being bred in Suva for liberation throughout the group of Islands; apparently the Coccinellid will prove to be by far the most useful enemy of the scale.

Local and sporadic outbreaks of *Promethecia reichiei* (leaf-mining beetle) occurred on coconut, but it does not appear to be a pest of much importance in Fiji; two indigenous parasites have been observed and *Pediculoides ventricosus* attacks the immature stages. *Tirathaba trichogramma* (smaller spathe boring moth) is a minor pest of coconuts. It occurs in Malaya, where it is attacked by three parasites that might be worth introducing into Fiji.

WATANABE (T.). **A Control Method for *Hellula undalis*, Fab. (Pyralidae), a Pest of Vegetables.** [In Japanese.]—*Agric. & Hortic.*, ii, no. 9, pp. 987–992. Tokyo, September 1927.

*Hellula undalis*, F., is distributed over the southern half of Japan. The larvae feed on cruciferous vegetables from July to October, sometimes causing serious damage. The adults emerge from the hibernated pupae about the middle of June, and there may be three or four subsequent generations, the moths being most abundant in August. Each female lays about 30 eggs, from 1 to 10 being deposited singly on a plant; the eggs hatch in 6 days. The larvae that hatch in September mature about the middle of October and mostly hibernate as pupae at the base of the food-plants; a few hibernate as larvae. The larval stage lasts about 20 days, and the pupal stage 10 to 14 days in summer, while the moths live for about 2 weeks. Spraying the young growth with derris, nicotine sulphate, pyrethrum or lead arsenate is recommended.

NIWA (S.). **Economic Control of *Aulacaspis pentagona*, Targ.** [In Japanese.]—*Agric. & Hortic.*, ii, no. 9, pp. 1000–1003. Tokyo, September 1927.

The Coccid, *Aulacaspis pentagona*, Targ., is one of the most serious pests of mulberry in Japan. There are usually three generations a year, but in the northern part of Honshu there are only two. The sprays recommended are oil emulsion in winter against the hibernating adults and lime-sulphur in May and June against the larvae.

HORI (H.). **On *Eurukuttarus nigriplaga*, Wileman.** [In Japanese.]—*Kontyu*, ii, no. 2, pp. 101–106, 1 pl. Tokyo, September 1927.

The adults of the Psychid, *Eurukuttarus nigriplaga*, Wileman, appear in October, and each female lays from 200 to 300 eggs in its larval case. The eggs hatch in April or May and the larvae feed at night and on dull days on the leaves of *Clematis* sp., *Rubus parvifolia* and *Perilla nankinensis*. From the middle of September onwards they leave these food-plants and pupate on trees, the adults emerging about two weeks later.

HARUKAWA (C.) & KONDO (S.). **The Use of Nicotine Sulphate in controlling *Laspeyresia molesta*, Busck.** [In Japanese.]—*Kontyu*, ii, no. 2, pp. 114–117. Tokyo, September 1927.

Spraying with nicotine sulphate was found to reduce the loss caused to pears by *Cydia* (*Laspeyresia*) *molesta*, Busck, by 50–75 per cent.

UMEYA (Y.). **Studies on the Silk glands of the Silkworm (*Bombyx mori*, L.).**—*Bull. Seric. Expt. Sta., Govt.-Gen. Chosen*, no. 1, pp. 27–48, 3 pls., 10 refs. Suigen, Korea, December 1926. [Recd., August 1927.]

These studies include investigations on the effect of removal of the silk-glands or of the spinneret, and observations on silk-secretion of the larva of *Bombyx mori*, L.

RAMACHANDRA RAO (Y.). **Fumigation of imported Seeds with special Reference to *Stephanoderes*.**—*Planters' Chron.*, xxii, no. 25, pp. 373-374. Madras, 18th June 1927.

Owing to the chance discovery of live adults, larvae and pupae of *Stephanoderes hampei*, Ferr., in a consignment of coffee seed from East Africa, the author points out the necessity of having a competent staff stationed at the main ports of entry to prevent the introduction of such pests into India. Methods of fumigating plants and seeds are briefly discussed.

[MEGALOV (V.) & BAZHENOV (G.).] Мегалов (В.) и Баженов (Г.). **Contribution to the Knowledge of injurious Forest Insects of the Saratov Government.** [*In Russian.*]—*Saratovsk. Gubernsk. Lesnoi Otdel*, 29 pp., 10 figs., 1 ref. Saratov, 1927.

The first part of this paper is the result of observations carried out in 1926, by Megalov, in an experimental forest in Saratov. Lists are given of the trees and other vegetation growing in the area under review and of the 86 insects collected. In all cases the food-plants are mentioned, and general notes are given on the more important species. Of the Buprestids the only one of economic importance is *Chalcophora mariana*, L. It is very abundant, the larvae developing on the unbarked stumps of *Pinus sylvestris*, the only species of pine recorded in the area under discussion. The barking of these stumps in the freshly felled areas would no doubt greatly reduce its numbers. The Curculionids, *Hylobius abietis*, L., and *Pissodes pini*, L., are common, in pine plantations, but cause no appreciable injury. The Chrysomelid, *Melasoma aenea*, L., is abundant, both the larvae and adults attacking the leaves of *Alnus glutinosa*.

The larvae of *Melolontha hippocastani*, F., cause considerable damage to the roots of young pines, 10-12 years old. In June the majority of the larvae were at a depth of 8-12 inches. The importance of the Longicorns, *Spondylis buprestoides*, L., *Monochamus galloprovincialis*, Ol., *Acanthocinus aedilis*, L., and *Rhagium inquisitor*, L., which occur in fairly large numbers, is not yet known. The bug, *Aradus cinnamomeus*, Pnz., causes considerable injury to young pines. *Lymantria* (*Ocneria*) *monacha*, L., though at present only occurring in isolated foci, is a serious potential pest of the pine plantations. *Stenolechia gemmella*, L., produces gall-like swellings on the ends of the young twigs of oak, causing them and the leaves on them, to wither.

The most important pests of the pine plantations are the bark-beetles *Myelophilus* (*Blastophagus*) *minor*, Htg., *M. (B.) piniperda*, L., *Ips acuminatus*, Gyll., *I. proximus*, Eichh., and *I. sexdentatus*, Börn. *M. piniperda* and *I. sexdentatus* usually breed in the first 10 feet in the thick bast of pines, the other species usually occurring above about 30 ft. One of the chief causes of the recent increase of these species is the neglect of the forests and forest fires.

In the second part of the paper Bazhenov discusses the infestation by bark-beetles at greater length. The area covered by the forest fires in 1920-22 amounted to 13,500 acres. During 1925 and 1926 large numbers of trap trees were distributed over the forest areas, besides numerous logs left in the felled areas as traps. The trap trees

were cut up into logs and raised from the ground so as to expose the entire surface to attack and to prevent rotting. The logs placed for the first generation of bark-beetles were also attacked by *Acanthocinus* and *Rhagium* and those for the second generation by *Monochamus* and Buprestids. The logs were barked when the larvae in them were near pupation, and the bark thus removed was left lying about, as the larvae soon died owing to exposure or attack by ants or other predators. Any standing trees that were attacked were promptly felled in the spring or summer and barked. As a result of these measures the infestation was considerably reduced, and no fresh centres of infestation have occurred since 1926.

*Lymantria monacha* occurred throughout the district in 1926, but only three severe infestations were recorded. As many as 11,000 eggs have been counted on one tree; they are mostly laid within 3 to 4½ feet of the ground. Attempts have been made to destroy the eggs by barking this part of the tree and burning the bark; but the effect of the treatment will not be apparent until the summer of 1927. In parts of the heavily infested area, trees were felled in lines so as to increase the possible parasitism of the larvae. Aeroplane dusting is not considered suitable under the present scattered condition of the infestation.

[MEGALOV (V.). Меганов (В.). *Lema melanopa*, L., a Pest of Oats, Barley and other Gramineous Plants. [In Russian.]—Saratovsk. Oblastn. S. Kh. Opuish. Stantz., Ent. Otd. [Saratov Reg. Agric. Expt. Sta., Ent. Dept.] 29 pp., 2 pls., 46 refs. Saratov, 1927. (With a Summary in German.)]

This is a detailed account of observations on the bionomics and control of *Lema melanopa*, L., in Saratov in 1923–25, some of the information having already been noticed [*R.A.E.*, A, xiv, 29]. The various stages are described. The adults appear late in June, when they feed very little if at all, and enter hibernation without laying any eggs. Oviposition begins the following May, and under experimental conditions continued until 19th July. As the beetles live for a very long time, it is possible that under natural conditions some of them may survive a second winter and resume oviposition the following spring. The author does not agree with Averin [*R.A.E.*, A, iii, 402] and others that there are two generations a year and that the second generation adults oviposit in the same year.

A dust of 1 part calcium arsenate to 5 parts finely sifted lime killed all the beetles, under experimental conditions, within 48 hours; good results were also obtained at half this strength, but a weaker dust, 1 : 15, only killed 93 per cent. of the beetles in 5 days. Tillering barley plants were used in these experiments and were not affected by the dust. The 1 : 5 dust was also applied to plants that had formed stems; a large number of the larvae on these succumbed within 12 hours after dusting, and the plants continued normal development after treatment. It is believed that this dust would be equally effective under field conditions; it would no doubt be best to apply it before most of the eggs are laid.

The larvae are attacked by an unidentified parasite, which pupates in the cocoon of the host.

[SAKHAROV (N.).] **Сажаров (Н.). The Importance of *Oscinella* (*Oscinosoma*) *frit*, to Grain Crops in the Region of the Lower Volga.** [In Russian.]—*Narkomzem R.S.F.S.R. Opuin. Delu Nizhne-Volzsk. Oblasti*, 26 pp. [Saratov, 1927.] (With a Summary in German.)

Extensive observations on *Oscinella frit*, L., have been made in the Lower Volga region, both in the field and in the laboratory, during the years 1924–26. There are presumably more than three generations a year, but they overlap considerably. There are three distinct periods of maximum flight. The first coincides with the time of tillering of spring-sown wheat, oats and barley, and its progeny causes the greatest injury. These adults emerge from cocoons in winter wheat, in which the larvae have hibernated; such infested stems wither and die, and the others produced by the winter wheat are, except in rare cases, too advanced to be used for oviposition. The adults therefore migrate for oviposition to the spring-sown wheat, barley and oats. The same procedure takes place in the case of development on wild food-plants. The first individuals of these spring adults appear as the second leaf of the summer crops is forming, usually at the beginning of May, depending on temperature conditions.

Under experimental conditions in June (average temperature of 18.4° C. [65.12° F.] and relative humidity of 64 per cent.), the eggs laid by these adults hatched in 4 days, the larval stage lasted 14 days and the pupal stage 11. In July and August (average temperature of 20.6° C. [69.08° F.] and relative humidity of 57 per cent.), the three stages lasted 4, 12 and 9 days respectively.

The progeny of the adults of the second (summer) flight period is of little economic importance, as most of the crop is too advanced for oviposition. Eggs may be laid in the secondary shoots that appear about this time, but as the latter would not mature in any case, the injury is negligible. The majority of the eggs are laid on self-sown cereals; owing to local climatic conditions these are seldom abundant, and the consequent lack of food-plants greatly reduces the numbers of the pest. The third (autumn) flight period occurs in August, coinciding with the sowing of winter rye and wheat, on which the eggs are laid. The resulting larvae hibernate in the stems and produce the adults of the spring flight period.

The importance of *O. frit* as a pest in the Lower Volga region varies in different localities, increasing in severity from the south-east to the north-western area with a decrease in temperature and increase in relative humidity. No promising results have so far been obtained in experiments to discover a resistant summer wheat, but experiments with barley appear more hopeful. Agricultural measures undoubtedly have some effect on infestation, but these require further study with reference to local conditions.

FEDOROV (S. M.). **Studies in the Copulation and Oviposition of *Anacridium aegyptium* (Orthoptera, Acrididae).**—*Trans. Ent. Soc. Lond.*, lxxv, pt. 1, pp. 53–61, 4 pls., 9 refs. London, 18th July 1927.

The contents of this paper, which is the result of observations in the Crimea, are indicated by its title.

[VERESHCHAGIN (B.).] VERESCEAGHIN (B.) **The Decline of Plum Orchards and Co-operation.** [In Russian.]—*Furnika*, no. 10, pp. 71–72. [Kishinev] 15th May 1927.

Owing to heavy infestations by *Lecanium* (*Physokermes*) *coryli*, Ldgr., the plum orchards in Bessarabia are rapidly deteriorating. The young larvae hatching from the eggs in July migrate from the branches to the leaves, where they feed on the lower surface. They hibernate on the bark of the branches or stems and sometimes on the ground. Those on the ground return to the branches in the spring, after which the adult stage is reached, oviposition occurring in June. Effective control may be obtained by spraying at the end of March and beginning of April with lime-sulphur mixture prepared by heating [R.A.E., A, iii, 396]. The importance of general co-operation in carrying out these measures is pointed out.

WIESMANN (R.). **Die beiden Knospenwickler : *Tmetocera* (*Eucosma*) *ocellana*, F., und *Olethreutes variegana*, Hb., als Knospenschädlinge der Apfelbäume im Wallis 1926.** [The two Bud-moths, *Eucosma ocellana* and *Argyroplece variegana*, as Apple Bud Pests in Valais in 1926.]—*Anz. Schädlingsk.*, iii., nos. 8–9, pp. 87–91, 103–108, 8 figs., 2 refs. Berlin, August & September 1927.

The apple pests present at the blossoming period in 1926 in the Swiss canton of Valais were the winter moth [*Cheimatobia brumata*, L.], the apple blossom weevil [*Anthonomus pomorum*, L.], and the bud-moths, *Eucosma* (*Tmetocera*) *ocellana*, Schiff., and *Argyroplece* (*Olethreutes*) *variegana*, Hb. Careful examinations showed that the last two are the chief cause of the destruction of buds. The larvae of both these Tortricids are described. After hibernating, they abandon their webs under old bud-scales in March or April and enter the opening bud-clusters, penetrating as far as the flower buds, three or four of which may be destroyed in a week by one larva. A caterpillar usually infests two or three bud-clusters.

The injury caused and the duration of the feeding differ in the two species. *A. variegana* destroyed up to four bud-clusters close to each other and pupated near them about the middle of May. The eggs were laid on buds or branches. While *A. variegana* fed exclusively on the pedicels and young leaves, *E. ocellana* also destroyed up to 76 per cent. of the axillary buds. As the formation of new shoots is thus prevented, the injury extends to the next growing season. The feeding of *E. ocellana* does not end with the destruction of the bud-clusters, but lasts well into July, holes being eaten in the half-grown apples; in some cases, 24 per cent. of the fruits were thus damaged. Pupation occurs among the leaves at the end of July, and the pupal period lasts a fortnight. The moths oviposit on the leaves and new shoots. The larvae of the new generation were first seen in mid-August and spun webs for hibernation in October. Some of the young larvae feed on the leaves, and a few individuals bore into the apples. Others do not feed, but shelter until they spin their hibernating webs.

In November the larvae of the two species were about equally abundant in their winter quarters under the bud-scales. Hibernating caterpillars are never found on the trunk or branches. They are of various ages and sizes. Examinations during the winter of 1926–27

showed *E. ocellana* to be predominant. At this period *Tortrix* (*Pandemis*) *ribeana*, Hb., was present, also hibernating in the larval stage. It has been stated that *P. ribeana* and *A. variegana* hibernate in the egg stage, but no confirmation of this was obtained.

A detailed account is given of the control of these pests. In 1926 and 1927 pre-blossom spraying with a mixture of 2 per cent. lead arsenate and 2 per cent. lime-sulphur gave excellent results, treatment at the correct date resulting in a full crop. Other moths that were destroyed by this spray were *Hyponomeuta malinellus*, Zell., *Hemerophila* (*Simaethis*) *pariana*, L., and *Cheimatobia brumata*, L.

GÖRNITZ (K.). **Ein neues Verfahren zur Feststellung der Haftfähigkeit von Verstäubungsmitteln.** [A new Method for determining the Adherence of Dust Insecticides and Fungicides.]—*Anz. Schädlingssk.*, iii, no. 9, pp. 101–103, 1 fig. Berlin, September 1927.

To test the adhesiveness of dusts the author used an apparatus consisting of a glass plate, measuring 12 by 12 inches, mounted on a stand keeping it at an angle of 60 degrees to the horizontal. Its upper surface is covered with black paper and is divided into two equal parts by a strip of card placed flat on the plate and running from top to bottom. The long edges of this card are turned up so that the strip forms a gutter. In the top part of this gutter rests a knocker that can be raised to a given height. To make the test 200 mgm. of the dust are shaken through a piece of gauze on to the upper portion of one of the divisions of the plate, and 200 mgm. of finely powdered French chalk are dusted in a similar way on to the other. The knocker is then raised and dropped ten times. The dust and the French chalk that have fallen off the plate are weighed within 5 mgm. of accuracy, and the dust remaining is calculated as a percentage of the French chalk remaining. This test is repeated several times, the materials being placed on different sides alternately, and finally an average figure is obtained. Taking the tested French chalk as 100, calcium carbonate was 30. The ability to increase adhesiveness by suitable treatment was shown by that of ordinary commercial ground sulphur being raised from 39 to 98 by the addition of a special proprietary material.

KALANDADZE (L.). **Einige Versuche mit Arsenmitteln gegen die Apfelbaumgespinstmotte** (*Hyponomeuta malinellus*, Z.). [Some Experiments with Arsenic Insecticides against the Apple Web Moth.]—*Anz. Schädlingssk.*, iii, no. 9, pp. 108–110. Berlin, September 1927.

In laboratory experiments with arsenical sprays and an arsenical dust against *Hyponomeuta malinellus*, Zell., in Germany, a proprietary lead arsenate spray gave the best results, 70 per cent. of the caterpillars being killed. The remainder pupated, but only 20 per cent. of the pupae produced adults. The arsenical dust gave the worst results, owing to its adhesiveness being inferior to that of the sprays.

DE SEABRA (A. F.). **A entomologia agricola nas suas relações com a patologia vegetal.** [Agricultural Entomology in its Relations to Plant Pathology.]—*Bol. Minist. Agric.*, vii, reprint 12 pp., 13 figs. Lisbon, 1926. [Recd. September 1927.]

In this lecture the injuries done to plants by insects are reviewed, instances being given of some well-known pests occurring in Portugal, and a plea is put forward for the further development of economic entomology in that country.

FEYTAUD (J.) & DIEUZEIDE (R.). **Sur un champignon parasite du *Reticulitermes lucifugus* Rossi.**—*C.R. Acad. Sci. France*, clxxxv, no. 14, pp. 671–672, 3 refs. Paris, 1927.

Several fungi of the genus *Termitaria* have been described as infesting termites in different parts of the world [*R.A.E.*, A, xv, 244], but it has been supposed hitherto that their parasitism was purely external. The authors have found a species of *Termitaria*, which in some respects closely resembles *T. snyderi*, a parasite of *Reticulitermes* in the United States, infesting *R. lucifugus*, Rossi, in the Bordeaux region. This fungus proved to be primarily an internal parasite.

The disease is contagious and persists in the termite colonies for years, but the proportion of individuals in a colony showing evidence of infection is always small, not more than 5 per 1,000.

WALTON (C. L.). **The Agricultural Zoology of North Wales.**—*Univ. Coll. N. Wales, Dept. Agric.*, 42 pp. Bangor, July 1927.

These notes on the chief agricultural and horticultural pests in the counties of Anglesey, Carnarvon, Denbigh and Flint, are the result of seven years' work. A list of the pests is given, with notes on their food-plants and general distribution, and on the work carried out, or in progress, in dealing with them.

FRIEND (H.). **A new Raspberry Pest.**—*Gdnrs.' Chron.*, lxxxii, no. 2130, pp. 331–332, 4 figs., 1 ref. London, 22nd October 1927.

Damage to raspberries, believed at first to be due to Coleopterous larvae, was found to be caused by *Scaptomyza graminum*, Fall. This fly is normally a leaf-miner, but the larva is here recorded as attacking the fruit and causing the base to wither. Probably there is more than one brood during the fruiting season, since experimentally the complete life-cycle took only three weeks.

WILSON (G. F.). **The Prevention of Insect Attacks in Gardens.**—*Jl. R. Hortic. Soc.*, lii, no. 2, pp. 235–245, 7 refs. London, August 1927.

The author points out the great value of preventive measures against insects before they have become pests. Insects are detrimental not only on account of the direct damage they do, but also by lowering the vitality of the plants and so encouraging fungous diseases, and by transmitting diseases from plant to plant. Factors that tend to encourage insect infestation include abundance of food as a result of intensive cultivations, favourable climatic conditions, and absence

of natural enemies. In this connection it is remarked that insectivorous birds are discouraged by the replacement of hedges by fences and by the destruction of woodlands and copses, and that ignorance of the appearance of insects often leads to the destruction of beneficial ones.

Certain suggestions for the prevention of insect attack (other than spraying, which, when practised before pests are present, is generally valueless) are outlined. These include, in addition to various cultural measures, the conversion of waste ground bordering gardens into arable land; the destruction of crop remnants and of rubbish in which insects may hibernate; the use of grease bands on trees and standard shrubs; the inspection and treatment of hedges and shelter belts, especially when made of deciduous plants, as these may require spraying if harbouring pests; the use of trap crops, such as cabbages, which may be used between waste land and cultivated areas to intercept migrating caterpillars; the prevention of introduction of new pests by careful selection of nursery stock and the use of resistant varieties.

SMITH (K. M.). **An Unusual Form of Parasitism of an Anthomyid Fly.**—*Parasitology*, xix, no. 2, pp. 260–262, 1 pl., 1 fig. Cambridge, 26th August 1927.

During the period May to August 1926 a few of the adults of *Phorbia* (*Hylemyia*) *brassicae*, Bch. (cabbage root fly) and an allied species were found to be parasitised by a micro-organism that appears to be a fungus. The internal organs of the fly had either entirely disappeared or were compressed into a small space dorsal to the cyst, and it is remarkable that the insects were still able to live and fly about in an apparently normal manner. How the fly becomes infected is not known, and unfortunately no stage in the development of the parasite could be found, other than the one here described, where the cyst and its external orifice had already formed.

SMITH (K. M.). **A Study of *Hylemyia* (*Chortophila*) *brassicae* Bouché, the Cabbage Root Fly and its Parasites. With Notes on some other Dipterous Pests of Cruciferous Plants.**—*Ann. App. Biol.*, xiv, no. 3, pp. 312–330, 1 pl., 10 figs., 19 refs. Cambridge, August 1927.

The author considers that *Phorbia* (*Hylemyia*) *brassicae*, Bch. (cabbage root fly), all stages of which are described, is closely allied to *Hylemyia antiqua*, Mg. (onion fly), and should be placed in the same genus. Observations were made on its bionomics under natural and artificial conditions. There are three generations a year. The normal duration of the egg stage appears to be 4–5 days, though in some cases, especially in the second generation, it was reduced to 3 days. The larval stage in the first and second generations varied between 19 and 25 days with an average of 23. In the third generation the earlier maggots developed in approximately the same period, but the later ones took much longer, some requiring 35 days. The author considers it possible that some individuals of this generation hibernate as larvae. Some larvae ceased feeding when the temperature fell in September and remained in cells in the cabbage root as if about to hibernate, though they became active some time later when the temperature rose and all pupated. It is thus possible that the maggots found in cabbage roots

in November and December are hibernating. The length of the pupal stage is very variable, in the first generation the longest period was 69 days and the shortest 11, while in the second generation the average was 15 days, the longest period being 18 days and the shortest 7. A considerable proportion of the second generation larvae did not emerge until the following spring, and all the third generation hibernated, the adults beginning to appear about the second week in May. When fed on sugar and water the adult males lived 9-35 and the adult females 14-38 days, but if no food was provided, the males began to die after 3 days and the females after 4 or 5. The flies in captivity, especially the females, evinced a desire for sugar that might be utilised in the employment of a poison bait such as recommended for *H. antiqua*. The average length of the life-cycle of flies bred in captivity was 46 days, with a minimum period of 37 and a maximum of 53 days.

The pre-oviposition period appears to last 7-8 days. As a rule the eggs are deposited on the stems of cruciferous plants at or below the level of the soil, though they are often placed in the surrounding soil or in the cavity between the soil and the stem. The number of eggs deposited at one time varies from 2 or 3 up to a dozen or more. The egg-laying habits of the flies of the third generation, especially those that emerge late, seem to be different, since larvae were found in the mid-rib and large veins of cauliflower and cabbage leaves late in September. The fact that in the autumn the stems of the food-plants are hard and woody would probably account for the change. The young larvae usually bore into the roots of the plants, but may attack the growing points of turnips and of cauliflowers before the head is formed as well as the inflorescences themselves, and also occur in the mid-rib and larger leaf-veins of various species of *Brassica*. Pupation usually takes place in the soil surrounding the roots of the food-plant; the majority of puparia were found at a depth of 3-5 inches, while others, particularly of the later broods, were as deep as 8-9 inches. Occasionally puparia are found adhering to the root itself, or the larvae may migrate laterally and the puparia may thus be found near the surface of the soil, 3-4 inches away from the plant. The larvae and pupae of *Phytomyza rufipes*, Mg., were found in association with those of *Phorbia brassicae*. The eggs of this fly are inserted in the tissue of the leaf blade, the place of oviposition being marked by a small whitish ring. The larvae usually live in the mid-rib and leaf base, but are occasionally found in the stem and growing points of young plants, and in the upper part of the root of species of *Brassica*. Pupation takes place mostly in the soil, though puparia have sometimes been found in the leaf-veins. There appear to be three or four generations in the season, adult flies being plentiful from May to October. The larvae were found causing considerable injury to the leaves of cauliflowers in autumn; more serious damage is occasionally done to young cauliflowers by the maggots boring into the growing point and causing blindness. The larva is heavily parasitised by *Dacnusa stramineipes*, Hal., which also parasitises the larvae of *Phorbia brassicae*.

Three other unidentified species of Dipterous larvae were found in association with those of *P. brassicae*, two of which lived mainly on decaying tissue.

The Staphylinid, *Aleochara bilineata*, Gyll., was bred in large numbers from the pupae of *P. brassicae*, but was itself parasitised by the Proctotrupid, *Exallonyx ligatus*, Nees. *A. bipustulata*, L. (*nitida*,

Grav.) was found associated with the puparia, and although it was not bred from puparia under observation, it seems likely that this insect is also predacious on the pupae. The Cynipid, *Cothonaspis rapae*, Westw., is by far the commonest of all the parasites affecting *P. brassicae*, over 30 per cent. of the second generation pupae being attacked. There appear to be two generations in the season. The larvae of another Anthomyiid, *Phaonia trimaculata*, Bch., are predacious on those of *Phorbia brassicae*. On several occasions the pupae of the Tachinid, *Onesia agilis*, Mg., were found associated with those of *P. brassicae*, and it is possible that the larvae of this fly are predacious on the root maggots, or that they feed on decaying matter and are therefore only secondary to the damage caused by the latter. An unusual form of parasitism of the adult fly by some kind of micro-organisms was also observed [see preceding paper].

TATTERSFIELD (F.) & GIMINGHAM (C. T.). **Studies on Contact Insecticides. Part VI. The Insecticidal Action of the Fatty Acids, their Methyl Esters and Sodium and Ammonium Salts.**—*Ann. App. Biol.*, xiv, no. 3, pp. 331–358, 9 diagrs., 20 refs. Cambridge, August 1927.

The following is the author's summary, the figures in square brackets representing the number of grams per 100 cc. necessary to kill 100 per cent. of the insects:—The toxicities to *Aphis rumicis*, L., of the fatty acids from formic to stearic and of the sodium and ammonium salts and methyl esters, applied as spray fluids, have been quantitatively determined. Two unsaturated acids, undecenoic and oleic, are included.

There is a rise in toxicity of the acids with increase of molecular weight as the series is ascended from acetic [5.0] to undecylic [0.093]. Formic acid is exceptional [3.5]. Beyond undecylic acid there is a fall in toxicity, and acids higher in the series than tridecylic [0.315] show only slight toxic action. The sodium salts of the fatty acids are in most cases much less toxic than the corresponding acids, though the difference is less marked with the higher acids. Oleic acid [1.0] and sodium oleate [0.75] are of the same order of toxicity. The ammonium salts are also generally less toxic than the corresponding acids, but the differences are much less than in the case of the sodium salts. With some of the higher acids, e.g., myristic [not materially toxic at 5.0] and oleic [1.0], neutralisation with ammonia increases toxicity [ammonium myristate, 1.84, and ammonium oleate, 0.5]. The relatively high toxicity of the ammonium salts may be due, at least partly, to liberation, by hydrolysis, of free fatty acid in a very finely divided state. Methylation of the fatty acids reduces toxicity; all the methyl esters are less toxic than the acids or ammonium salts. Both the ammonium salts and the methyl esters show, like the acids themselves, increase of toxicity with increase of molecular weight up to a certain point. The formates are exceptional. The fatty acids do not show marked toxicity to the eggs of *Selenia tetralunaria*, Hüfn., at concentrations below 2 per cent. Possible relationships between certain physical properties (physical state, volatility, dissociation constants, partition co-efficients and surface tension) of the fatty acids and their insecticidal action are discussed. Determination of partition co-efficients [degree of separation of the acid] as between olive oil and water and comparison of the figures with the relative toxicities show a steady rise in toxicity with a decrease in the partition co-efficients

(water/oil) from acetic to capric acid. Formic acid is again exceptional. With lauric and oleic acids there is a break in the correlation. The bearing of the solubility relationships of the acids on these results is considered.

MILES (H. W.) & PETHERBRIDGE (F. R.). **Investigations on the Control of Wireworm.**—*Ann. Appl. Biol.*, xiv, no. 3, pp. 359–387, 2 pls., 24 refs. Cambridge, August 1927.

This is a complete account of investigations on the control of wireworms in Great Britain begun in the autumn of 1925. The greater part of the information has already been published elsewhere [*R.A.E.*, A, xiv, 185; xv, 63, 485], though slight differences occur in some of the minor details. Field observations on the movement of wireworms in the soil throughout the autumn, winter and spring indicate that there is a definite downward migration in autumn and an upward migration in spring. Correspondingly wireworm activity in the surface soil was noted to be at its height in September and October, and March, April and May. There seems to be another downward migration in summer, probably in response to temperature and moisture conditions.

During the course of the work much experience was gained as to the most suitable method of using bait and subsequently applying calcium cyanide, and the following tentative recommendations are made. The land should be cleared of weeds and the soil worked to as fine a tilth as possible a week or so before the bait is set. The bait, preferably wheat or oats, should be sown 2–3 in. deep in rows 2–4 ft. apart according to the value of the crop to be grown and the extent of wireworm infestation. The rows of bait should be examined at intervals of four days, since the time of application of the calcium cyanide depends on the rate at which the wireworms appear in the bait. Under ordinary conditions the maximum number will be reached in about a fortnight, but in cold weather a week or ten days longer may be necessary. The calcium cyanide may be satisfactorily applied by means of a hand drill fitted with a deep plough attachment, depositing the cyanide below the level of the bait at a depth of about 4 in. About 2 lb. calcium cyanide to each 100 yds. of bait row is usually sufficient to ensure over 75 per cent. mortality of the wireworms under ordinary field conditions. Under glasshouse conditions where 100 per cent. mortality is most desirable, 3 lb. to each 100 yds. should be used. The calcium cyanide should be covered with soil immediately after application and the land rolled to close the larger air spaces and prevent the rapid escape of the hydrocyanic acid gas. Six or seven days after treatment, the land can be lightly cultivated and opened up to liberate any residual fumes, and plants can be set or seed sown within the next two days. Spring seems to be the most satisfactory time to use this method, since, although numbers of wireworms are attracted to baits in the autumn, the steady fall in soil temperature induces a cessation of feeding and causes the majority of them to migrate deeper into the soil. If treatment must be carried out in the autumn, it should be done in late September or early October. Calcium cyanide should not be applied when the land is wet, for drilling is difficult, even distribution almost impossible, and the hydrocyanic acid gas does not permeate the soil effectively. Baits can be successfully applied seven or eight months after grass-land has been ploughed; before this time, the presence of turf annuls the influence of the bait. If such land must be treated for

wireworms, calcium cyanide can be applied by means of a hopper fixed to the beam of an ordinary plough, regulated to sow the insecticide just in front of the falling furrow slice.

EIDMANN (H.). **Ameisen und Blattläuse.** [Ants and Aphids.]—*Biol. Zentralbl.*, xlvii, no. 9, pp. 537–556, 6 figs., 11 refs. Leipzig, 1927.

A detailed account is given of the relations between *Lasius niger*, L., and the Aphids it was observed to protect.

DAVIDSON (J.). **The biological and ecological Aspect of Migration in Aphids.**—*Sci. Prog.*, xxi, no. 84, pp. 641–658; xxii, no. 85, pp. 57–69, 5 figs., 2 diagr., 17 refs. London, 1927.

The following is substantially the author's summary: The Aphidoidea, on biological grounds, may be divided into two families, the APHIDIDAE (true Aphids or plant-lice) and the PHYLLOXERIDAE (including *Chermes*). In the former family, the sexual females are oviparous and the parthenogenetic females viviparous; in the latter both the sexual and parthenogenetic females are oviparous. These insects may further be separated into two groups according to whether the life-cycle is completed on one type of plant (non-migrating species) or whether part of the cycle occurs on one type of plant, on which the fertilised eggs are laid (primary food-plant), and the other part, which consists only of parthenogenetic generations, on other types of plants (intermediate food-plants), between which there is a regular, periodic migration.

With the migrating species, the primary food-plants are trees or shrubs (excluding species like the pea aphid, *Illinoia* (*Macrosiphum*) *pisi*, that migrate only between herbaceous plants); the intermediate food-plants may be herbaceous plants, or other trees and shrubs. The complete life-cycle is practically confined to species in temperate climates. In warmer countries the sexual phase is frequently suppressed and continuous parthenogenetic reproduction occurs. The migrating habit has developed in association with the changes in the world's flora. Those species that are primarily non-migrating, such as members of the Lachnini and Callipterini, exhibit certain primitive characters, which place them among the least specialised forms. The migrating species, on the other hand, exhibit a varying degree of specialisation of habit and form, correlated with the extent to which the migrating habit has developed. The species of *Chermes* have attained the most specialised development of the migrating habit, and the life-cycle takes two years for its completion. In the APHIDIDAE (excluding *Hormaphis*), the complete life-cycle occupies one year, and various stages in the development of the migrating habit are to be found; in general those species associated with herbaceous plants (APHIDINI) represent the most recent development. Correlated with the migrating habit, there has been marked specialisation both in the sexual and parthenogenetic individuals. Several species are known in which the association with the primary food-plant has been lost, resulting in parthenogenetic races or species living entirely on the intermediate food-plants.

MORDVILKO (A.). **L'anolocyclie chez les Pemphigiens des pistachiers.**—*C.R. Acad. Sci. France*, clxxxv, no. 4, pp. 295–297. Paris, 1927.

The author briefly states his hypothesis concerning the disappearance in northern latitudes of sexuparous forms of Aphids of the tribe

FORDEA, which includes all the Pemphigines forming galls on *Pistacia* (and on *Rhus*), leaving only the winged and wingless parthenogenetic females (virginiparae) that feed on grasses [*R.A.E.*, A, xi, 564; xiii, 476]. Winged virginiparae still appear on grasses at the end of spring and beginning of summer, but fly to other grasses and produce young that descend to the roots where they found new colonies. In this way grasses are attacked by *Forda*, *Paracletus*, *Gеоica*, etc. These anholocyclic forms are now regarded as distinct species, but morphologically they still bear a striking resemblance to the exules of the holocyclic forms, and their winged virginiparae are still like the winged sexuparae, which in May-June settle on the trunks of *Pistacia* in warmer latitudes.

The author discusses the relationships of a number of holocyclic and anholocyclic forms and draws some general conclusions as to the time of disappearance of the primary food-plant in areas where anholocyclic forms occur. The nearest anholocyclic form to the exules of *Forda follicularia*, Pass., is *F. marginata*, Horv., which is widely distributed in Europe especially in the south, where it is found on roots of wheat and other grasses. *Paracletus cimiciformis*, Heyd., is without doubt an anholocyclic form of some Pemphigine of *Pistacia*. It is found on the roots of wheat and barley in southern Europe and also occurs in Britain and south Sweden. *Trifidaphis perniciosus*, Nevskii, which is usually known as *Gеоica (Tychea) phaseoli*, Pass., is widely distributed in Europe on the roots of *Beta*, *Brassica*, etc., and is recorded also from Turkestan on those of cotton. The gallicolae of this species have been found by the author on leaves of *Pistacia*. *Aploneura lentisci*, Pass., is found throughout Europe, and the author considers that *Rhizobius graminis*, Buckt., is its anholocyclic form.

MARCHAL (P.). Contribution à l'étude génotypique et phénotypique des *Trichogrammes*. Les lignées naturelles de *Trichogrammes*.—*C.R. Acad. Sci. France*, clxxxv, no. 9, pp. 489-493; no. 10, pp. 521-523. Paris, 1927.

The distinctions between the species of the Chalcid genus *Trichogramma* are not yet well defined, and there is a tendency among authors to recognize only one species, *T. evanescens*, Westw., for most of the European forms [*R.A.E.*, vii, 231; xii, 559] on account of the existence of forms intermediate between the described species.

For three years the author has studied two closely related forms of *Trichogramma* that occur in his garden near Paris and consequently cannot be regarded as geographical sub-species or races. He describes the colour differences between these, which he designates *T. evanescens*, typical form, and *T. cacoeciae (cacaeciae)* [sp. n.]. In this garden *T. evanescens* is found chiefly in cabbage beds where it parasitises the eggs of such insects as *Barathra (Mamestra) brassicae*, L., *Pieris brassicae*, L., *P. rapae*, L., *Phlyctaenia (Pionea) forficalis*, L., and Syrphids. *T. cacaeciae* is found in shady places on apple and old quince trees, where it parasitises the eggs of *Tortrix (Cacoecia) rosana*, L.

*T. evanescens* has 8-10 generations a year from spring to autumn, consisting of both males and females, all of which are normally winged. The females may oviposit parthenogenetically, but in this case only males are produced. *T. cacoeciae* has ordinarily only two generations a year. The adults of the summer one, which appear in June and July, are normally winged, while those of the spring one have only vestigial

wings. Reproduction is parthenogenetic, both generations being composed of females, males appearing only very exceptionally. The eggs of *Tortrix rosana* are laid in groups of about 60 on the branches at the beginning of July. The winged generation of the parasite then lays its eggs in them, generally leaving the outer ones untouched; the wingless adults emerge in March and April and oviposit in the eggs that were not attacked by the winged generation, and in which the embryonic larvae, of the host, having undergone a long diapause, are not yet too advanced for the development of the parasites.

The author was able to induce winged parthenogenetic females of *T. cacoeciae* to oviposit in the eggs of *Barathra brassicae*, which only take a few days to develop instead of the 9 months necessary for those of *Tortrix rosana*. The parasite adapted itself completely to its new host, accelerating its development to produce a series of winged parthenogenetic generations in a year, each only requiring a month for completion, as in the case of *T. evanescens*. Similar results were obtained when *T. cacoeciae* oviposited in eggs of *Ephestia*. *T. cacoeciae* evidently regulates its development to that of its host. It appears that the host egg, or its envelope, contains substances that hasten or retard development and that act in the same manner on the embryo of the parasite as on that of the host. In the case of the parasite the retarding effect only appears to be exercised as it approaches pupation.

In further experiments, the author found that however favourable the conditions were, *T. evanescens* refused to oviposit on eggs of *Tortrix rosana*, though it did so freely when given those of *Barathra brassicae*. He attempted to cross the two forms by placing normally parthenogenetic females of *T. cacoeciae* with males of *T. evanescens*. Although females that had paired oviposited in eggs of *Barathra brassicae*, the resulting insects presented maternal characters, without any paternal ones, as did also their progeny. Apparently, therefore, it is impossible to produce hybrids of these two forms as the eggs of *T. cacoeciae* are not fertilised but develop parthenogenetically. Attempts at crossing male *T. cacoeciae* with female *T. evanescens* would be interesting if males of the former could be obtained. In central France the author found a form of *Trichogramma* that in its behaviour and seasonal dimorphism is very like *T. cacoeciae* from near Paris, and produces females parthenogenetically, but differs from it in colour.

The author considers that although his experiments have shown that the differences in rate of development between *T. evanescens* and *T. cacoeciae* are apparently dependent upon external causes (*phénotypique*) the colour differences are hereditary (*génotypique*), and that these two forms are genetically (*génotypiquement*) if not specifically distinct. He suggests that if observations were made on *Trichogramma* from various hosts and localities, a number of strains would be found having the status of races or elementary species, the formation of which has been helped by thelyotokous parthenogenesis.

PAILLOT (A.). **Sur deux Protozoaires nouveaux parasites des chenilles de *Pyrausta nubilalis* Hb.**—*C.R. Acad. Sci. France*, clxxxv, no. 14, pp. 673–675, 2 figs. Paris, 1927.

The results of a study of *Pyrausta nubilalis*, Hb., in France tend to confirm the author's previous conclusions that bacteria play a less important part in the natural destruction of insect pests than do protozoa or virus diseases. Two protozoan diseases of *P. nubilalis* were

studied, one, fairly common in parts of the Jura, caused by a microsporidian related to those of *Pieris brassicae*, L. [*R.A.E.*, A, vi, 177, 190; xii, 337], the other, which is apparently very rare, caused by a flagellate. Larvae of *P. nubilalis* attacked by the former show no difference externally from healthy ones. The parasite, which is described as *Perezia pyrausta*, sp. n., is found principally in the malpighian tubes and in the silk glands, and is transmitted from one larva to another by way of the digestive tract.

The flagellate, which is described as *Herpetomonas* (*Leptomonas*) *pyraustae*, sp. n., is characterised by the abundance of parasites in the lumina of the malpighian tubes, which appear hypertrophied, and of the intestinal tract.

PAILLOT (A.). **Sur l'Epidémiologie de la Gattine du Ver à Soie et de la Flacherie vraie ou Flacherie de Pasteur.**—*C.R. Soc. Biol.*, xcvi, no. 25, pp. 766–768. Paris, 26th August 1927.

An account is given of the infection of silkworms [*Bombyx mori*, L.] by *Streptococcus bombycis* [*R.A.E.*, A, xv, 270] and of the factors necessary to produce an epidemic. The complication of the disease with flacherie is also discussed.

DA COSTA LIMA (A.). **Microlépidoptère nouveau dont la chenille dévaste les orangers du District Fédéral (Brésil).**—*C.R. Soc. Biol.*, xcvi, no. 25, pp. 835–837. Paris, 26th August 1927.

The information in this account of *Gymnandrosoma aurantianum* has already been noticed from another source [*R.A.E.*, A, xv, 526].

[PUKHOV, B. A.] Пухов (Б. А.). **The Migratory Locust and its Control.**—*Bibl. Agron.*, 84 pp., 25 figs., refs. Moscow, 1927. Price 85k.

This is a general account of bionomics and control of *Locusta migratoria*, L., in European and Asiatic Russia.

**Agricultural Pests Act, 1911. Proclamation no. 12 and Regulations.** 2 pp. Pretoria, January 1927.

To prevent the spread of mosaic disease of sugar-cane in South Africa, the Province of Natal and Zululand are declared restricted areas. From 14th January 1927 no variety of sugar-cane, except Uba, may be planted in the restricted areas without a permit. From 30th June 1927, except by special permit, no other variety of sugar-cane may be kept in these areas or moved within or from them. The destruction may be ordered of any other variety.

MORRIS (H. M.). **Entomological Notes.**—*Cyprus Agric. Jl.*, xxii, pt. 3, pp. 65–67. Nicosia, July 1927.

A fourth list [*cf. R.A.E.*, A, xiv, 519] of insects recorded in Cyprus is given, in most instances without any food-plants. Those reported to be definitely injurious are the Pentatomids, *Eurydema festum* var. *pictum*, H.-S., and *Dolycoris baccarum*, L., attacking cereals and potatoes, the Scolytid, *Phloeotribus scarabaeoides*, Bern. (*oleae*, F.), boring in olive twigs, and the Noctuid, *Laphygma exigua*, Hb., damaging leaves

of potato, tomato, etc. Insects recorded as definitely beneficial are the Coccinellid, *Chilocorus bipustulatus*, F., and the Hymenoptera, *Pristomerus vulnerator*, Panz., *Ephialtes extensor*, Taschbg., and *Ascogaster quadridentatus*, Wesm., which apparently parasitise larvae of the codling moth [*Cydia pomonella*, L.]; *Microbracon* (*Habrobracon*) *brevicornis*, Wesm.; and *Anastatus bifasciatus*, Boy., a parasite of the eggs of *Thaumetopoea wilkinsoni*, Tams [but cf. *R.A.E.*, A, xiv, 621].

BODENHEIMER (F. S.). **Third Note on the Coccidae of Palestine.**—*Agric. Rec. P.Z.E. Inst. Agric. & Nat. Hist.*, no. 2, pp. 177–181, 5 figs. Tel-Aviv, Palestine, June 1927.

These additions to the previous lists [*R.A.E.*, A, xii, 460; xiv, 622] bring the number of species of Coccids known in Palestine to 90. They include *Ripersia asphodeli*, sp. n., on *Asphodelus microcarpus*, and *Trabutina palestina*, sp. n., on *Tamarix*.

CORBETT (G. H.). **Annual Report of the Government Entomologist for 1926.**—*Malayan Agric. Jl.*, xv, no. 5, pp. 168–173. Kuala Lumpur, May 1927. [Recd. August 1927.]

Several of the pests recorded in this report were mentioned in the previous one [*R.A.E.*, A, xiv, 557]. Coconut pests include a Psychid, *Mahasena* sp., the larvae of which damage the younger palms particularly, and *Erionota* (*Hidari*) *thrax*, Moore, which appears sporadically on older coconuts, stripping the leaves up to the veins. Investigations on *Tirathaba* sp. near *trichogramma*, Meyr., have shown that if the sheath is entirely removed the damage to both male and female flowers is negligible, and this measure is so successful that further experiments for the control of the moth are considered unnecessary. The extent of nut-fall caused by this insect is being studied. The moth prefers to oviposit on the inflorescences of spikes that burst inwards rather than on widely open spikes. On spikes allowed to open naturally, about 30 per cent. of the original flowers remain on the spikes to become nuts, about 10 per cent. are damaged by the caterpillar and about 60 per cent. fall from other causes, but some spikes have transverse fibrous strands preventing the inflorescences from bursting, and these are always more heavily infested. *Oryctes rhinoceros*, L., continues to damage some palms up to five years of age, because certain wild palms are not destroyed at the same time as other jungle stumps. As a precaution against damage by the grubs of *Plesiocha reichei*, Chap., the seedlings should be immersed in lead arsenate before transplanting in the field. The small weevil, *Dio-calandra frumenti*, F., unlike *D. taitensis*, Guér., does not bore into healthy tissue, but is always associated with decaying tissue and is often found on fallen female flowers.

Damaged leaves of African oil-palm [*Elaeis guineensis*] were found to harbour the following insects: *Lonchaea* (*Carpolonchaea*) *calva*, Bezzi, and another species of the same subgenus; two Chloropid flies of the genus *Gampsocera*; the Tineid, *Opogona leucodeta*, Meyr.; *Tambinia capitata*, Dist., which sucks sap from the recently opened leaves and may cause the discoloration seen on older leaves; the Aphids, *Cerataphis lataniae*, Boisd., and *Oregma nipae*, v.d.G., and the Aleurodid, *Aleurocanthus gateri*, Corb., which are abundant on the leaves; and the Coccids *Paralecanium expansum*, Green, var., and *Ischnaspis longirostris*, Sign. Insects injuring the bark of rubber trees and damaging the tapping

surface included *Acanthopsyche snelleni*, Heyl., and occasionally crickets, the Noctuid, *Homodes bracteigutta*, Wlk., and the Arctiid, *Chionaema amelaena*, Hmps., while larvae of the Noctuid, *Corgatha (Palara) implexata*, Wlk., were reported as injuring the tapping cut over a considerable area. The leaves of rubber were attacked by larvae of the Lymantriid, *Notolophus (Orgyia) turbatus*, Butl., which migrated from the cover crop, *Centrosema*.

Pests of rice included the Pentatomid, *Scotinophara coarctata*, F., and *Agrotis* sp., which, however, was so highly parasitised that control measures were unnecessary. Insects on minor crops included the Noctuid, *Amyna punctum*, F., defoliating *Croton*; the Pyralid, *Glyphodes coeruleiceps*, Hmps., rolling the leaves of gambier [*Uncaria gambir*]; the Limacodid, *Parasa lepida*, Cram., on *Nipa*; and the Hispid, *Wallacea palmarum*, Gestro, the larvae and adults of which attack the bases of the young leaves of *Areca* [*catechu*].

FEDERATED MALAY STATES. **Plant Importation Rules, 1925. Gaz. Notification no. 4881, 7th August 1925, no. 16, Vol. xvii.—F.M.S. Enactments, 1925, pp. 185–188. [Kuala Lumpur, 1926.]**

STRAITS SETTLEMENTS. **Plant Importation Rules, 1925. Ordinance, no. 166.—S.S. Roy. Proc. & Orders, 1925, no. 768, pp. 22–25. Singapore, 1926.**

No plants may be introduced into the Federated Malay States or Straits Settlements from any place outside the Malay Peninsula, except at Port Swettenham, Singapore or Penang. Except under permit, the following plants may not be introduced: Para rubber [*Hevea*], cotton (other than cotton seed and lint, grown within and despatched from any part of the Dutch East Indies and landed at Singapore), sugar-cane, seed nuts of coconut, living and growing palms, coffee (except dried beans for consumption or transshipment) and banana suckers for planting taken from all sub-species and varieties of *Musa sapientum*, *M. cavendishi*, *M. paradisiaca* and, in the case of the Federated Malay States, *M. textilis*. All of these plants must bear a certificate of freedom from pests from the country of origin, and on being introduced are inspected and quarantined or treated as deemed necessary, all charges being borne by the importer.

STRAITS SETTLEMENTS. **Pests Notification Rules, 1925. Ordinance, no. 166.—S.S. Roy. Proc. & Orders, 1925, no. 769, pp. 21–22. Singapore, 1926.**

The appearance on any land of larvae of *Artona catoxantha*, Hmps., which attack the leaves of coconut, must be notified within 14 days. Certain diseases must also be notified.

MENZEL (R.). **Die Teekultur in Niederländisch-Indien und ihre tierischen Schädlinge.** [Tea Cultivation in the Dutch Indies and its Animal Pests.]—*Verh. naturf. Ges. Basel*, xxxviii, pp. 341–354. Basle, 1927.

A popular account of tea pests in the Dutch East Indies is given, with notes on their control.

TAKAHASHI (R.). **Some Aphididae collected by Dr. F. Silvestri in China.**—*Boll. Lab. Zool. gen. agrar. Portici*, xx, pp. 147–149, 1 fig. Portici, 1927.

Forty-two species of Aphids are known from China, including the following recorded for the first time: *Unilachnus orientalis*, Tak., on leaves of *Pinus* sp.; *Geocica lucifuga*, Zehnt., and *Astegopteryx cuspidatae*, Essig & Kuw., from unknown food-plants; *A. fici*, Tak., on the lower surface of the leaves of *Ficus* sp.; and *Oregma silvestrii*, sp. n., of which the wingless viviparous female is described from an unknown food-plant.

KUWANA (I.). **A List of Coccidae (Scale Insects) known from China.**—*Lingnaam Agric. Rev.*, iv, no. 1, pp. 70–72. Canton, March 1927.

This list includes 76 species, the food-plants being recorded in almost all cases.

HOFFMANN (W. E.). **Coccidae from China with a List of Host Plants.**—*Lingnaam Agric. Rev.*, iv, no. 1, pp. 73–76. Canton, March 1927.

The collection of the Lingnan University includes 21 Coccids not recorded in the previous paper; they are here listed with their food-plants. A list is also given of a further 40 species reported from China according to the records of the United States Bureau of Entomology; the food-plants of these species are not known.

TILLYARD (R. J.). **Biological Control of St. John's Wort.**—*N.Z. Jl. Agric.*, xxxv, no. 1, pp. 42–45. Wellington, N.Z., 20th July 1927.

St. John's wort (*Hypericum perforatum*) was probably introduced into Victoria as a garden plant over 50 years ago, and now occupies about 150,000 acres in that State. It appeared somewhat later in New Zealand and has taken longer to become acclimatised, but is spreading alarmingly in several localities. It is dangerous to stock of all kinds, causing fever and itching, leading to lesions from rubbing and scratching. A study has been made of the most important insects attacking *Hypericum* in Europe, with a view to introducing them for the purpose of biological control. These include the beetles, *Chrysomela hyperici*, Forst., and *C. varians*, Schaller, which are very prevalent in Great Britain, where there are two generations in a year, the winter being passed in the adult stage. Larvae of the first generation occur in June–July and those of the second in August–September, the second generation being oviparous and the first apparently viviparous. In New Zealand the hibernation period would probably be much shorter, with more generations and complete viviparity. A long series of experiments indicates that these two species feed exclusively on *Hypericum*, but more exhaustive tests are being made.

The Geometrids, *Anaitis plagiata*, L., and *A. efformata*, Guen., feed voraciously in the larval stage on the leaves and flower-heads of *Hypericum*, though they probably attack other plants also. The larva of the Noctuid, *Actinolia polyodon*, Cl., devours numbers of the leaves and flower-heads during July and August and hibernates in the pupal stage. This species does not occur in Great Britain but is widespread on the Continent of Europe. Tineid moths that attack the leaves and shoots

in Great Britain include *Depressaria hypericella*, Hb., *Gracilaria auroguttella*, Steph., *Epinotia hypericana*, Hb., and *Aristotelia atrella*, Haw. The first-named spins the shoots together, and may prove valuable in preventing flowering of the plant, but the life-history and food-plants of each species will require study before their introduction can be definitely recommended.

Certain gall-forming Cecidomyiids attack *Hypericum* in the warmer parts of Europe, the most important being *Dasyneura (Perrisia) hyperici*, Bremi, and *D. (P.) serotina*, Winn. Both species destroy the flowering shoots, the former making a rosette of a number of unfolding leaves, the latter attacking only the two terminal ones. *D. (P.) braueri*, Handl., is particularly promising as its larva stops the growth of the shoot while still underground. These galls are confined to *Hypericum* and, if food tests with the insects prove satisfactory and they become established, it is thought that they would almost completely prevent the plant from seeding. Larvae, probably of *Apion brevirostre*, Hbst., destroy the growing seeds within the capsules in Central Europe and might prove of great value.

Thorough investigation into the details of the life-histories of all species should first be made in England, and starvation tests made on all important economic plants common to Europe and Australia or New Zealand, only those species giving negative results on all plants except *Hypericum* being eventually chosen for introduction. Further tests would then be made in closed insectaries in Australia or New Zealand on plants of economic importance.

GIRAULT (A. A.). **Records of Australian Thysanoptera (Thrips). Parts I and II.**—*Queensland Agric. Jl.*, xxvii, pt. 5, pp. 403–406; & xxviii, pt. 4, pp. 348–352. Brisbane, 1st May 1927 & 1st October 1927.

In the first part of this paper records of the distribution and food-plants of 37 species of Australian Thysanoptera are given. The second part contains records for 21 additional species with additional records for species mentioned in the previous part.

MUNGOMERY (R. W.). **[Report of the Southern Assistant Entomologist.]**—*Queensland Agric. Jl.*, xxvii, pt. 5, pp. 394–395. Brisbane, 1st May 1927.

The females of the Melolonthid, *Lepidoderma albohirtum*, Waterh. (greyback cane-beetle), deposit their eggs about a fortnight after emergence and feed during this interval on a large range of plants, chiefly of the *Ficus* and *Eucalyptus* groups. It is generally recognised that the presence of these trees in the proximity of cane fields has a decided influence on infestation by the grubs, and, in the north of Queensland, there has been a general tendency either to destroy them or to have them in such a position that the beetles from them can be caught or otherwise effectively controlled. This procedure is not recommended against *P[seudoholophylla] furfuracea*, Burm., since it has been almost definitely established that the females of this Dynastid do not feed on any kind of foliage to promote further development of the eggs after pairing. Since the presence of trees does not explain the occurrence of this pest in various parts of a district, and in soils of a comparatively uniform texture, colour, etc., analyses were made of

samples of soil from infested and uninfested areas (which are always clearly defined). No outstanding differences were found in the chemical composition, though the humus and potash contents were somewhat lower in the soil from infested areas. The deficiency of humus is not alone responsible for the appearance of grubs in certain blocks of sugar-cane, since fields heavily manured with green crops have subsequently been attacked. The persistence of these infested patches from year to year has often been noticed and is perhaps due to the homing instincts possessed by several members of this family, which infest the same fields annually or biennially, according to the life-cycle of the beetle. *P. furfuracea* has been known to oviposit in fallow land that had been previously infested with grubs. It has been reported that the application of potash manures has cleared infested land of larvae, so that the potash deficiency may possibly favour grub infestation.

BATES (G.). [Report of the Assistant Entomologist at Bundaberg. March-April, 1927.]—*Queensland Agric. Jl.*, xxvii, pt. 5, p. 397. Brisbane, 1st May 1927.

Owing to abnormal weather conditions, which prevented thorough cultivation, cane fields, especially those in low-lying situations, became infested with *Phragmatiphila truncata*, Wlk. (sugar-cane moth borer), serious damage occurring in two districts. Sugar-cane left in the field appears to be a favourable breeding-place, and in blocks of mixed varieties it is found that the softer canes suffer most damage; harder varieties should therefore be planted where this pest is particularly abundant. The larvae attack both young and mature cane, but are usually controlled in the locality under consideration by a Braconid parasite; one host larva, parasitised under natural conditions, yielded 94 parasites and another 75. The parasite breeds rapidly and can easily be reared under laboratory conditions. Clean cultivation is one of the best means of controlling the pest; headlands, etc., should be kept free from grass and weeds, and trash should be buried or burnt. It has been proved that *P. truncata* will breed in certain thick-stemmed grasses, which should therefore be destroyed.

JARVIS (E.). **Cane Pest Combat and Control.**—*Queensland Agric. Jl.*, xxvii, pt. 5, pp. 398–399. Brisbane, 1st May 1927.

In March the sets and basal parts of several sugar-cane stools planted on land cleared of scrub the previous year were infested with termites. Such trouble can usually be avoided by taking care, when land is cleared, to remove all big roots and stumps. All infested stools should be dug up and burnt and the holes treated with 1–8 oz. benzene or carbon bisulphide to kill any termites in the soil. The earth above should be wetted and pressed down to keep the fumes from escaping.

An egg cluster of a predacious Asilid (robber fly) was found on the foliage of a young cane plant. These clusters usually contain one to two hundred or more eggs. Observations indicate that the larvae, although predacious in habit, can subsist for a time on organic matter in solution between the soil particles, until they find small grubs or similar soft-bodied subterranean insects. Probably the commonest species of Asilid fly attacking cane-grubs in the Cairns district is *Promachus doddi*, Ric.

JARVIS (E.) **Entomologist's Hints for May, 1927.** — *Queensland Agric. Jl.*, xxvii, pt. 5, pp. 399-400. Brisbane, 1st May 1927.

Formulae are given for two poison baits and a spray for grasshoppers, in view of the possibility of an outbreak of *Locusta migratoria* ph. *danica*, L. (*australis*, Sauss.).

WOOD (E. J. F.). **Cane Diseases.** — *Queensland Agric. Jl.*, xxvii, pt. 6, pp. 498-499. Brisbane, 1st June 1927.

Sugar-cane planted on a newly cleared hillside facing a block infected with mosaic became diseased. No Aphids were observed, but *Perkinsiella saccharicida*, Kirk. (cane leafhopper) was very prevalent. The author points out that while secondary infection is transferred readily across a valley from a hillside to that facing it, it rarely spreads across a ridge, and concludes that the insects concerned are borne by the wind rather than by flight and do not readily descend on a slope facing to leeward.

BATES (G.). **Cane Pests [in Southern Queensland.]** — *Queensland Agric. Jl.*, xxvii, pt. 6, pp. 500-501. Brisbane, 1st June 1927.

The Eumolpid, *Rhyparida morosa*, Jac., has been particularly abundant during the last few months, especially in neglected cane fields and fields adjacent to the river bank, but no actual damage has been reported. Soil fumigation with either carbon bisulphide or paradichlorobenzene is recommended against the larvae. Experiments carried out to test the relative value of lead arsenate and calcium arsenate dusts against the adult beetles showed that calcium arsenate kills more rapidly, gives a relatively higher mortality, is cheaper to apply and costs about one-third as much as lead arsenate.

Several species of grasshoppers, including *Locusta migratoria* ph. *danica*, L. (*australis*, Sauss.) were numerous on the headlands of cane fields. A poison bait, composed of 25 lb. bran, 1 lb. Paris green or arsenic, 6 finely chopped lemons or oranges, 2 qts. molasses, and 2 gals. water, gave good results when scattered in the early morning at the rate of 10 lb. to the acre.

JARVIS (H.). **The San José Scale (*Aspidiotus perniciosus*, Comst.).** — *Queensland Agric. Jl.*, xxvii, pt. 6, pp. 513-517, 1 pl. Brisbane, 1st June 1927.

A brief account is given of the life-history and control of *Aspidiotus perniciosus*, Comst., which occurs wherever deciduous fruit-trees are grown in Australia. The natural enemies mentioned [cf. R.A.E., A, xiii, 642] are the Coccinellids, *Orcus australasiae*, Boisd. and *Rhizobius* sp., and the larvae of the Tineid, *Batrachedra* sp., which are predacious, the parasite *Coccophagus clariscutellum*, Gir., the fungus, *Sphaerostilbe coccophila*, and some of the small birds, particularly *Acanthiza pusilla* (brown tit warbler) and *Smicrornis brevirostris* (short-billed tree tit).

JARVIS (E.). **Cane Pest Combat and Control.** — *Queensland Agric. Jl.*, xxviii, pt. 1, pp. 7-8. Brisbane, 1st July 1927.

The author considers that the apparent scarcity of larvae of *Lepidoderma albohirtum*, Waterh. (grey-back cockchafer) in certain

districts is chiefly due to natural factors of control. Prolonged spells of dry weather occurring during the period October to January are responsible at times for a mortality of 95 per cent. or more, since the beetles are unable to reach the surface of the ground when it is hard and dry. The mortality is greatest in areas cleared of trees and shrubs where the whole surface is exposed to the sun, and in such areas the beneficial effects may continue for several years.

The establishment of the pest in a district invaded by migrating beetles may often be due to the presence in the proximity of cane fields of trees on which the adults feed. The importance of the situation of these trees in relation to the fields and to the prevailing winds is discussed. Where necessary, large trees, such as *Semecarpus australiensis* (tar tree) or *Ficus bejamina* (weeping fig), should be destroyed, and smaller trees may be used as traps [cf. *R.A.E.*, A, xv, 348].

The topography of the country also appears at times to influence infestation during the oviposition period, the tops or ridges of hilly country of volcanic origin often being more heavily infested than low-lying areas [*R.A.E.*, A, xv, 28]. During migration over level country, the beetles appear to fly at a fairly uniform distance of about 15-25 ft. from the ground, and gravid females would be particularly likely to settle when encountering obstruction in the form of high ground. The height at which the beetles travel is probably influenced by prevailing atmospheric conditions, and the occurrence of several abnormally wet nights might induce females to avoid low-lying land as unfit for oviposition. This may also help to explain why sugar-cane grown on well-drained soil of a friable nature is very liable to infestation.

GOWDEY (C. C.). **Report of the Government Entomologist.**—*Jamaica: Ann. Rept. Dept. Agric. 1926*, pp. 16-17. Kingston, 1927.

The results of experiments on the use of paradichlorobenzene for protecting bananas from *Cosmopolites sordidus*, Germ., in infested areas seem promising. Dried bananas were attacked by *Calandra* (*Sitophilus*) *oryzae*, L., *Ephestia kühniella*, Zell., *Silvanus* (*Orvzaephilus*) *surinamensis*, L., *Lasioderma serricornis*, F., and the Nitidulid, *Carpophilus dimidiatus*, F. *Aleurocanthus woglumi*, Ashby, and the Coccids, *Lepidosaphes beckeri*, Newm., *Pinnaspis minor*, Mask., *Chrysomphalus aonidum*, L., and *Selenaspidus articulatus*, Morg., continue to be much in evidence on *Citrus*. Experiments have shown that certain proprietary oils are the best means, other than fumigation, of controlling the Coccids. The bagworm, *Oeceticus abbotti*, Grote, was reported as attacking oranges. The larvae of the fiddler beetle [*Prepodes vittatus*, L.] and other grubs infesting the roots of grapefruit and orange were effectively controlled by paradichlorobenzene. *Stenocranus saccharivorus*, Westw. (West Indian cane-fly) seriously retarded the growth of sugar-cane in some districts; it was attacked by a fungus and by the Reduviid, *Zelus rubidus*, Lep. & Serv., which did not, however, cause much reduction in its numbers. Other pests of sugar-cane were the Noctuids, *Cirphis latiuscula*, H.-S., *C. humidicola*, Guen., *Laphygma frugiperda*, S. & A., and *Remigia* (*Mocis*) *punctularis*, Hb., *Diatraea saccharalis*, F., *Trionymus* (*Pseudococcus*) *sacchari*, Ckll., *Sipha flava*, Forbes, *Eutermes* (*Leucotermes*) *ripperti*, Ramb., and on ratoons, the Oedemerid beetle, *Oxaxis schistacea*, Kirsch (not hitherto recorded in Jamaica). Maize was attacked by *Melanotus* spp. (wireworms) and by the Noctuids occurring on sugar-cane. Coconuts were infested by

*Oeceticus abbotti* and *Pseudococcus nipae*, Mask., and grapes by *Aspidiotus uvae*, Comst., and by the Bostrychid, *Apate* (*Amphicerus*) *terebrans*, Pall. Stored tobacco leaves were attacked by *Lasioderma serricorne* (cigarette beetle), and stored maize by *Calandra oryzae*.

HUTCHINGS (C. B.). **Report of Insects for the Year 1926.**—57th Ann. Rept. Ent. Soc. Ontario, 1926, pp. 7–9. Toronto, 1927.

Notes are given on a number of pests recorded in the Ottawa district in 1926, several of which were mentioned in the previous season's report [*R.A.E.*, A, xv, 31]; others include *Plutella maculipennis*, F. (diamond-back moth), causing severe injury to turnip foliage; the grasshoppers, *Melanoplus bivittatus*, Say, and *M. femur-rubrum*, DeG., which were numerous locally; *Oberea bimaculata*, Ol. (raspberry cane borer), which was particularly abundant and injurious; and the tent caterpillars, *Malacosoma americana*, F., and *M. disstria*, Hb., which were abundant in June on apple, choke cherry [*Prunus virginiana*], etc.

HUTCHINGS (C. B.). **A Study of *Balaninus obtusus* Blanchard; or, a Life History in a Hazel Nutshell.**—57th Ann. Rept. Ent. Soc. Ontario, 1926, pp. 9–12, 2 figs., 5 refs. Toronto, 1927.

During the summers of 1924 and 1925 a study was made of the life-history of *Curculio* (*Balaninus*) *obtus*, Blanch., attacking *Corylus rostrata* (beaked hazel) in Quebec. During June the weevils may be seen on the old flower-heads and the neighbouring bracts. Eggs were found as early as 10th June; at this time the outer shell of the nuts was very soft, and the egg punctures were readily detected by the brownish spot on the side of the husk. The eggs were deposited, one in each puncture, near the outer surface of the nut, within the area that later was to be the hard shell. The adults feed on the surface of the nuts, causing irregular roughened areas; practically all nuts showed signs of attack. By 10th July the adults had disappeared and the last eggs were hatching. About 13th August the larvae examined appeared to be practically mature; they had tunnelled into the kernel, in some cases destroying most of it. The infested nuts drop to the ground, and the larva burrows into the earth, where it passes the winter within a loosely constructed earthen cell, just below the surface of the ground. The adults emerge the following June. A short description is given of the egg, larva and adult. As the adults drop to the ground at the slightest disturbance, they might be collected by placing a sheet or other suitable receptacle under the bushes and jarring them. All infested nuts should be removed from the bush and those on the ground collected and burnt. Cultivating the soil in the spring will expose many of the larvae. Nuts in storage should be fumigated with carbon bisulphide for 48 hours.

CAESAR (L.). **Paradichlorobenzene as a Control for the Mushroom Mite.**—57th Ann. Rept. Ent. Soc. Ontario, 1926, pp. 17–18. Toronto, 1927.

The author records a case in which paradichlorobenzene was stated to have been successfully used for the control of *Tyroglyphus lintneri*, Osb., infesting mushrooms beds. The best results were obtained with 1½ lb. to 400 sq. ft. The beds were thoroughly dried out and the

crystals scattered evenly over the entire surface, without any care to avoid the mushrooms; after treatment the surface was damped slightly with a fine syringe, and the mushroom house was tightly closed for 48 hours. Practically all the mites were killed, but a second application was made after 10 days to kill any that might have hatched in the interval. The infestation was completely controlled and no injurious effect on the mushrooms was noticed.

The author points out that though this appears to be a very satisfactory method of dealing with the mushroom mite, experiments should be made to ascertain the best method of application and the smallest effective dose, and whether the mushrooms are uninjured under all conditions.

HUDSON (H. F.) & WOOD (A. A.). **Some Preliminary Observations on the Life History of the Armyworm, *Cirphis unipuncta*, Haw.**—*57th Ann. Rept. Ent. Soc. Ontario, 1926*, pp. 22–24. Toronto, 1927.

Very little has been heard of *Cirphis unipuncta*, Haw., in Ontario since the outbreak in 1914, when the losses to grain crops and pasture fields were estimated at £50,000, not reckoning the damage caused in eastern Ontario and other parts of Canada. Such outbreaks apparently occur at irregular intervals of from 14 to 20 years, depending possibly on weather conditions and the presence or absence of natural enemies. Early in the spring of 1925 sugar baits were used, the first moth being caught on 18th May, which is unusually early. Between 3rd and 29th June, 25 moths were captured; they were again seen on the wing on 23rd July and were taken in small numbers until 13th August. No larvae were found. In 1926 the first moths appeared on 17th June, the flight period lasting until 19th July. The moths were slightly more abundant, and as the number of traps was increased, 192 individuals were secured, which were used for experiments.

Most of the observations were made in field cages. Flight appears to be a necessary requisite to successful mating and oviposition. Where couch grass [*Agropyrum repens*] was present in the cages, the eggs were usually thrust between the folded sides of a blade and glued along the grooves with a sticky fluid, the sides of the blade being drawn together; a few may be found on unfolded leaf blades, or between the leaf sheath and the stem. The eggs hatch in 4 or 5 days. Larval development may be accelerated by the quantity and nature of the food supplied. When fed exclusively on maize leaves the larvae matured in 41 days, on timothy grass [*Phleum pratense*] in 48–50 days, on oats in 47–53 days, and on barley followed by maize in 47–51 days. Maize had to be substituted for barley when the latter became too ripe. Pupation occurs just below the surface of the soil, at an average depth of half an inch; in a large field cage no pupae were found below this depth.

The autumn flight period lasted from about the middle of August until the beginning of October.

McLAINE (L. S.). **The Activities of the Division of Foreign Pests Suppression.**—*57th Ann. Rept. Ent. Soc. Ontario, 1926*, pp. 20–22. Toronto, 1927.

The work of the division of foreign pests suppression is divided into two main groups, *viz.*, the inspection of imported and exported plants, and the control of foreign pests recently introduced.

During the past season only 95 nests of the brown-tail moth [*Nygmia phacorrhoea*, Don.] were collected in Nova Scotia [cf. *R.A.E.*, A, xv, 38], and it is hoped that this pest will eventually be exterminated. No nests have been found in New Brunswick since 1917-18. The European corn borer [*Pyrausta nubilalis*, Hb.] has spread considerably [see next paper]. Since the establishment of a parasite laboratory in 1923 for rearing and colonising parasites of *P. nubilalis*, 2,577,000 individuals of *Microbracon* (*Habrobracon*) *brevicornis*, Wesm., and 118,600 of *Pimpla* (*Exeristes*) *roborator*, F., have been liberated. At present two new parasites, *Apanteles thompsoni*, Lyle] and *Microgaster* sp., are being bred.

The inspection of pines for the presence of the pine shoot moth [*Rhyacionia buoliana*, Schiff.] has been carried out [*R.A.E.*, A, xv, 40], and infestations have been discovered at 45 points in Ontario and one in British Columbia. An attempt has been made to clean up each infestation, and the work will be continued in 1927. This moth is established in at least 15 of the United States.

KEENAN (W. H.). **The Spread and Degree of Infestation of the European Corn Borer in Canada, 1926.** *57th Ann. Rept. Ent. Soc. Ontario, 1926*, pp. 24-27. Toronto, 1927.

The European corn borer [*Pyrausta nubilalis*, Hb.] has invaded 60 new townships in Ontario and also spread to Quebec [cf. *R.A.E.*, A, xv, 440]. The fact that silos are used extensively in Quebec may delay any serious outbreaks there.

MARSHALL (J.). **The Occurrence of the European Corn Borer in Ontario in Plants other than Corn and its Significance.**—*57th Ann. Rept. Ent. Soc. Ontario, 1926*, pp. 28-32. Toronto, 1927.

The work of various authors on the experimental infestation of plants other than maize by the European corn borer [*Pyrausta nubilalis*, Hb.] is reviewed, and lists are given of the food-plants attacked under natural conditions in Ontario, and of those that serve for shelter. A list is also given of plants common in maize fields, but never attacked; these all have milky juices.

Only very rarely does oviposition take place on any plant other than maize, oats, or barley. In oats, and possibly in barley, the larvae can survive to at least the fifth instar, but both these crops are harvested before the larvae reach maturity. In the case of oats near the borders of the fields the larvae are likely to complete their development in weeds, but even under conditions of severe infestation very few will survive if the field has been properly tilled. Occasionally *P. nubilalis* may develop from egg to maturity in *Dahlia*, *Gladiolus*, *Zinnia* and sugar-beet. There is no indication that under Ontario conditions it will attack any other crops, so long as maize is grown on a commercial scale. If, as is expected, very little early maize is grown in certain counties in 1927, oats and barley will probably be severely infested, while some moths may migrate to neighbouring counties. It is believed that if maize-growing were abandoned over the entire Province, *P. nubilalis* would continue to reproduce in alternative food-plants and in the course of time might become adapted to others, such as hemp or hops. So long as there is a little maize grown, there is reason to believe that the moth will concentrate on it to the exclusion of other plants.

MARSHALL (J.). **The Larval Mortality of the European Corn Borer in 1926.**—*57th Ann. Rept. Ent. Soc. Ontario, 1926*, pp. 33–34. Toronto, 1927.

Studies on mortality of eggs and larvae of the European corn borer [*Pyrausta nubilalis*, Hb.] have been continued on the same lines as in previous years [*R.A.E.*, A, xv, 41]. The mortality in 1926 amounted to 86.6 per cent., and the observations indicate a distinct correlation between the amount of mortality in the experiments and the average field infestation. The egg parasite, *Trichogramma minutum*, Riley, was responsible for a certain amount of mortality in 1925, but no parasitism was evident in 1926. The observations on the various factors influencing the mortality and the number of eggs laid are still in progress.

CAESAR (L.). **The European Corn Borer. The Outlook in Ontario.**—*57th Ann. Rept. Ent. Soc. Ontario, 1926*, pp. 35–38. Toronto, 1927.

The present situation and the future outlook with regard to the European corn borer [*Pyrausta nubilalis*, Hb.] in Ontario are discussed.

MITCHENER (A. V.). **The Currant Fruit Fly, *Epochra canadensis*, Loew, in Manitoba (Diptera, Trypetidae).**—*57th Ann. Rept. Ent. Soc. Ontario, 1926*, pp. 38–41, 1 fig. Toronto, 1927.

*Epochra canadensis*, Lw., is probably one of the most destructive pests of red and white currants (*Ribes rubrum*) in Manitoba. It also attacks flowering currant (*R. aureum*) and probably black currant (*R. nigrum*). Observations on it were made in 1925 and 1926 in the field, laboratory and outdoor insectary. The adults usually appear from about the end of the first week in June until about 12th July. All the fruits punctured by the females ripen prematurely and fall to the ground, even though no eggs have been laid in them. The eggs are inserted immediately under the skin of the fruit, currants that are about three-quarters grown being chosen for this purpose. The larvae hatch in 5–8 days, and tunnel first immediately under the skin and then to the centre of the fruit, where they attack the seed. The larva is mature in 11–16 days, when the currant may be on the ground or still on the bush, but in either case the larva enters the soil for pupation. The pupal stage lasts about 11 months, there being thus one generation a year.

No satisfactory method of dealing with this pest has so far been found.

CAESAR (L.). **An Outbreak of the Turnip Aphid, *Aphis pseudobrassicæ* Davis.**—*57th Ann. Rept. Ent. Soc. Ontario, 1926*, pp. 41–43. Toronto, 1927.

*Aphis pseudobrassicæ*, Davis, caused considerable injury to turnips during 1926 in Ontario, and appears to have occurred almost all over Canada. The results of experiments with various sprays were very disappointing, as although many of the Aphids were killed, a sufficient number survived to have caused reinfestation in a week or so, had they not been destroyed by natural agencies, of which the most important

was apparently a fungus disease. Of the sprays tried, kerosene emulsion (approximately 8 per cent. with several times the ordinary amount of soap) gave the best results. It is believed, however, that dusting is the only method that will prove effective on a large scale. A dust of 5 lb. 40 per cent. nicotine sulphate and 95 lb. hydrated lime killed almost all the Aphids when applied on both sides of the row.

It appears probable that the outbreak in 1926 was the result of some particularly favourable conditions that are unlikely to occur again for some years.

A local outbreak of *Brevicoryne (Aphis) brassicae*, L., on cabbage in August was controlled by natural enemies, including the Coccinellid, *Hippodamia convergens*, Guér., which was abundant.

PAINTER (R. H.). **Some Notes on the Oviposition Habits of the Tarnished Plant Bug, *Lygus pratensis* Linn., with a List of Host Plants.**—*57th Ann. Rept. Ent. Soc. Ontario, 1926*, pp. 44–46, 2 figs. Toronto, 1927.

An extract is given from a paper by Brittain and Saunders [*R.A.E.*, A. vii, 179], including records by other authors, on the oviposition of *Lygus pratensis*, L., but it is not clear which generation they had under observation, as the exact number never appears to have been determined with certainty. Biological studies on this Capsid were undertaken in the spring of 1925 in Ontario, as a result of which 9 plants are recorded as used for oviposition by the overwintering generation in the Ottawa district. Of these, so far as is known, dandelion (*Taraxacum officinale*), wild currant (*Ribes* sp.), black currant (*R. nigrum*), night flowering catchfly (*Silene noctiflora*) and ox-eye daisy (*Chrysanthemum leucanthemum*) have not been previously recorded. A list of plants on which oviposition has been obtained in cages is also given. In no case were any of the plants on which eggs were laid by the overwintering generation used for this purpose by the spring generation.

The eggs are laid in a variety of ways, and it is impossible to state any definite location in which they may be found. They are usually distributed singly, but sometimes occur in groups. The eggs of the overwintering adults were first found on 22nd May in 1926. They hatched in a few days, and the nymphs reached maturity about the middle of July. The adults from these nymphs laid their eggs on beet, white turnip, *Erigeron* sp., Swiss chard and *Helichrysum*, the last two being apparently new records.

BENNETT (C. W.). **Virus Diseases of Raspberries.**—*Michigan Agric. Expt. Sta.*, Tech. Bull. 80, 38 pp., 11 pls., 35 refs. East Lansing, Mich., May 1927.

The author describes five distinct virus diseases of raspberries, namely, curl, red raspberry mosaic, mild mosaic, yellow mosaic and streak, all except the last-named having been transmitted by means of Aphids. Infection experiments that have been carried on during the past four years are recorded. The results show that of the three species of Aphids known on raspberries in Michigan, *Amphorophora sensoriala*, Mason, has not been known to transmit any virus disease; the other two species show a decided specificity in the transmission of disease, *Amphorophora rubi*, Kalt., transmitting red raspberry mosaic, yellow and mild mosaic, but apparently not curl, while *Aphis rubiphila*,

Patch, has readily transmitted curl on all susceptible varieties tried, but rarely, if ever, transmits any of the other diseases in question [cf. *R.A.E.*, A, xv, 598]. Observations in the field seem to support these findings. Plants have shown symptoms of curl as a result of the feeding of a single individual of *A. rubiphila*, although the percentage of infection in tests in which only one Aphid was placed on each plant has been much lower than in tests in which many Aphids were used. When infective individuals of this species were kept in culture, they transmitted curl after having been away from contact with living plants for 48 hours, and there are indications that individuals fed on curl-immune varieties of raspberry carried the virus for a period of more than 3 weeks. Apparently the curl virus does not pass to the egg of an infected Aphid, for plants infested with Aphids reared from such eggs remained free from the disease. The wide varietal ranges of susceptibility, apparent immunity, and disease tolerance in relation to the virus diseases that are to be found in the raspberry group are discussed, and the importance of careful and efficient roguing and of selection and production of virus-free nursery stock is explained. Several other insects, including two species of Aphids found in greenhouses, mealybugs and leafhoppers, as well as mites, have been tested as potential vectors of curl and red raspberry mosaic, but the results have in every case been negative.

**Plants and Plant Products, the Entry of which into the United States is restricted or prohibited.** *U.S. Dept. Agric., Fed. Hortic. Bd., S.R.A., no. 91, pp. 87-94. Washington, D.C., August 1927.*

This is an annotated list of the plants and plant products, the entry of which into the United States is restricted or prohibited under the Federal Plant Quarantine Act of 1912. Under each plant, etc., are tabulated the countries involved, an exact statement of the articles covered, and a brief explanation of the economic importance of the insect or disease the exclusion of which is the basis of the restrictions.

**Quarantine on account of the Mexican Fruit Worm. Notice of Quarantine no. 64, with supplemental Rules and Regulations.—U.S. Dept. Agric., Fed. Hortic. Bd., 4 pp. Washington, D.C., August 1927.**

To prevent the spread of *Anastrepha ludens*, Loew (Mexican fruit worm), certain areas in Texas are quarantined as from 15th August 1927. No mangos, sapotas (including all fruit of Sapotaceae and *Casimiroa*), peaches, guavas, apples, pears, plums, quinces, apricots, manneys [*Mammea americana*], ciruelas [*Spondias*], or fruits of *Citrus*, except lemons and sour limes, from the regulated areas may be moved interstate, except under certain conditions of control and inspection. Each year, beginning in March and lasting seven months, none of these fruits may be produced or allowed to exist in the regulated areas, except under certain conditions. No restrictions are placed on the interstate movement of fruit that has been manufactured or processed in such a manner as to eliminate danger of carrying the pest. Containers of fruit allowed to be moved must be clearly marked with the name of the fruit and the name and address of the consignor.

**Quarantine on account of the Pink Bollworm revised. Notice of Quarantine no. 52 (revised). Rules and Regulations supplemental to Notice of Quarantine no. 52 (revised).**—*U.S. Dept. Agric., Fed. Hortic. Bd.*, 5 pp., 1 map. Washington, D.C., 9th July 1927.

To prevent the spread of *Platyedra gossypiella*, Saund., the States of Texas, New Mexico and Arizona are quarantined, and certain areas in them regulated from 1st August 1927. Stalks, bolls and other parts of the cotton plant and gin waste may not be moved interstate from regulated areas, and seed cotton may only be moved for ginning. Cottonseed and cottonseed hulls, cake and meal may only be moved after satisfactory sterilisation. Cotton lint may only be moved after satisfactory compression and disinfection. Wrappers, vehicles, etc., used in connection with cotton may only be moved after satisfactory disinfection. Hay and other farm products not specifically provided for in these regulations may be moved interstate without restriction until further notice. Cotton and other articles permitted to be moved must be plainly labelled as directed. The articles enumerated above may move interstate from an area not under regulation through a regulated area on a through bill of lading. The original Notice of Quarantine and previous regulations [*R.A.E.*, A, x, 594; xiv, 300] are superseded by this revision.

MUTCHLER (A. J.) & WEISS (H. B.). **The Dermestid Beetles of New Jersey.**—*New Jersey Dept. Agric.*, Circ. 108, 31 pp., 4 pls., 19 refs. Trenton, N.J., April 1927. [Recd. September 1927.]

This account includes all the Dermestids known to occur in New Jersey, as well as those likely to occur because of their world-wide or neighbouring distribution. Keys are given to the genera and species, with notes on each species, the information being largely taken from the literature. A short account is given of remedial measures, such as fumigation, cold storage and exposure to a vacuum. Various other measures that have been recommended are discussed under the species concerned.

**Entomology.**—*45th Ann. Rept. Ohio Agric. Expt. Sta.*, 1925-26, Bull. 402, pp. 49-64, 5 figs., 1 map. Wooster, Ohio, 1927.

An increase in infestation by the European corn borer [*Pyrausta nubilalis*, Hb.], amounting in some districts to 500 per cent., occurred in Ohio in 1926, and in a few instances serious damage was caused. A table showing the number and position of borers in the stalk at various dates between 20th August and 10th September shows that the longer maize is allowed to stand after it is mature, the lower the borers will be and the greater the number left in the stubble after harvesting. Disking standing stalks and high stubble has been found to be unsatisfactory as a control measure. Ploughing stubble is of considerable value, and shredding infested stalks results in almost complete destruction of the borers. The results of burning stalks, after first cutting or breaking them off and then raking them in two directions, have proved fairly satisfactory. Mechanical measures alone, however, have been found inadequate in controlling the borer. In a field cut late in October, where the remaining stubble measured 3.5 in., many stalks broke during the process of cutting, with the result that about 12,000 borers to the

acre were left after harvesting. It was found that maize planted from 10th May to 1st June is likely to carry heavier infestation than maize planted later.

*P. nubilalis* has shown a distinct tendency to concentrate in various localities, and the greatest damage occurred in drained swamps below the level of Lake Erie [cf. *R.A.E.*, A, xv, 439, 536].

Experiments indicated that excessive drought was inimical to larval development. As larvae in infested stalks stored where they receive no moisture either die before reaching the adult stage or emerge as moths so late as to be negligible, maize in dry storage is not considered an important source of reinfestation. The moths live longer and deposit more eggs under conditions of high humidity than low humidity. They were found to be capable of detecting the difference between extracts from maize planted early, to which they are particularly attracted, and those from maize planted late.

Infestation of apple by various leafhoppers that hibernate in the egg stage under the bark was reduced, in some cases by as much as 50 per cent., by delayed dormant oil sprays. An outbreak of rosy apple aphid [*Anuraphis roseus*, Baker] occurred in orchards in southern Ohio in June but caused little damage, while the green apple aphid [*Aphis pomi*, DeG.] was rare until early August.

Infestation by codling moth [*Cydia pomonella*, L.] was increasingly severe. The results of biological observations made to ascertain the most favourable date for spraying are given. Five applications of dust were less effective than three applications of spray, and oil used as an ovicide was ineffective.

The Mycetophilid, *Pnyxia scabei*, Hopk. (potato scab gnat), became an important pest of the potato crop in 1926. In some fields 60 per cent. of the potatoes were injured. The larvae feed first on the seed-piece, the fleshy part of which is often almost entirely consumed, and later on the tubers of the current crop, in which the injury varies from abrasions of the skin to the destruction of a large part of the tuber. They have also been found feeding on and boring into the stems of the plant below the surface of the ground.

An outbreak of *Aphis rumicis*, L., occurred on Lima beans [*Phaseolus lunatus*], causing a reduction of the yield and a crop of uneven quality. Experiments showed that almost perfect control could be effected by one treatment with a 1.6 per cent. nicotine dust applied with a self-mixing power duster equipped with a canvas drag, which covered the rows for 10 ft. or more behind the duster.

Dormant applications of miscible oil or oil emulsion at full strength destroyed the eggs of the European red mite [*Paratetranychus pilosus*, C. & F.].

BURGESS (A. F.) & CROSSMAN (S. S.). **The Satin Moth, a recently introduced Pest.**—*U.S. Dept. Agric.*, Dept. Bull. 1469, 22 pp., 1 pl., 5 figs., 3 refs. Washington, D.C., February 1927.

This is a detailed account of the Lymantriid, *Stilpnotia salicis*, L. (satin moth) in the United States, giving additional data on its distribution, life-history, parasites and control, obtained since the publication of a preliminary account [*R.A.E.*, A, ix, 574]. In 1922 the pest was found in the State of Washington, and it is now established on poplars and willows in many localities in the north-western part of the

State. By 1926 the infested area in New England extended to over 12,000 square miles, in a belt about 60 miles wide along the Atlantic coast from southern Maine to eastern Connecticut.

All stages and the biology of the moth, including the seven larval instars, are described. The third instar larvae do not normally leave the hibernating webs, which are constructed at the end of the second instar, until the spring, and those that do apparently die without hibernating. They emerge from hibernation in the latter part of April and the first three weeks of May, feed on the epidermis of the leaves for 5-6 days, and spin webs for moulting. The larvae of the fourth, fifth and sixth instars feed for 5-6 days, eating the whole leaf tissue, and spin moulting webs in crevices in the bark; those of the seventh instar feed for about seven days and then spin cocoons on the leaves, in crevices or on fences, etc., near the trees, the moths emerging about ten days later.

In the field *S. salicis* has been observed on various species of poplar (*Populus*) and on golden willow (*Salix vitellina*), and these are the only plants on which it is known to be able to complete its development through all the larval stages. Larvae fed on scrub oak (*Quercus ilicifolia*) until hibernation completed their development in the following year on poplar, and larvae fed on poplar until hibernation completed their development on scrub oak; larvae fed on black oak (*Q. velutina*) during the first two instars hibernated successfully but failed to reach maturity on this tree. Twelve other trees, including apple, pear and three species of oak, on which larvae failed to reach the hibernating stage, are listed.

The most effective method of controlling *S. salicis* has been found to be spraying, as soon as the trees are in leaf, with lead arsenate, using 3 qts. fish oil or linseed oil to 400 gals. spray as a sticker; excellent results have been obtained by applying lead arsenate at the rate of 6 lb. powder to 100 U.S. gals. water with a high-pressure sprayer and a solid-stream spray. The egg-masses, when abundant, may be destroyed by painting them with crude coal-tar creosote to which a small quantity of lamp black is added so that a residue is left on the treated ones. If the infestation is very heavy and larvae swarm on buildings, they can be swept or washed to the ground and crushed.

Native parasites that have been reared from *Stilpnotia salicis* in Massachusetts are the Scelionid, *Telenomus californicus*, Ashm., which is the commonest, from the eggs, the Tachinids, *Zenillia blanda*, O.S., *Frontina frenchi*, Will., and *Phorocera claripennis*, Macq., from the larvae, and *Tachina mella*, Wlk., and *Winthemia quadripustulata*, F., from the larvae and pupae, and the Ichneumonids, *Theronia fulvescens*, Cress., *Ephialtes pedalis*, Cress., and *Pimpla (Itoplectis) conquisitor*, Say, and the Pteromalid, *Dibrachys hemerocampae*, Gir., from the pupae. Various birds feed on the larvae to a considerable extent.

Several parasites and the predacious Carabid, *Calosoma sycophanta*, L., introduced from Europe to control *Porthetria dispar*, L. (gipsy moth) and *Nygmia phaeorrhoea*, Don. (brown-tail moth), have been found to attack *Stilpnotia salicis*. The most important of these is the Tachinid, *Compsilura concinnata*, Mg. [*R.A.E.*, A, xiv, 258]. Others are the Tachinid, *Blepharipa scutellata*, R.-D., the Pteromalid, *Eupteromalus nidulans*, Först., and probably the Braconid, *Apanteles melanoscelus*, Ratz., while in the laboratory small larvae were attacked by *A. vitripennis*, Hal., and eggs by *Ooencyrtus (Schedius) kuwanac*, How. In the spring of 1926 it was found that a mortality of 45 per cent. among

hibernating larvae of *S. salicis* had occurred in several localities, 20·7 per cent. being apparently due to *Eupteromalus nidulans*, which is an external parasite, each larva of which destroys several larvae of the host. A fungus associated with a few of the dead larvae appeared to have been responsible for 2·6 per cent. mortality, and part of the remainder may have been due to mites that occurred in some numbers in the webs containing dead larvae.

VAN DINE (D. L.). **A List of the Insects affecting Sugar Cane in Cuba.**—*Trop. Plant Res. Foundation*, Bull. 3, 16 pp., 33 refs. Washington, D.C., 25th October 1926. [Recd. September 1927.]

This is an annotated list of the insects recorded on sugar-cane in Cuba, arranged in accordance with the type of injury they inflict. In addition to the scientific names the English and Spanish names are given, and parasites are enumerated in some cases.

BALLOU (H. A.). **Insect Pests of Sugar-cane.**—*Trop. Agriculture*, iv, no. 9, Sugar Suppt., pp. 49–50. Trinidad, September 1927.

The chief pests of sugar-cane in the West Indies and elsewhere are very briefly reviewed, with particular reference to the sugar-cane froghopper [*Tomaspis saccharina*, Dist.] in Trinidad, some account being given of the investigations already begun in connection with this insect and of problems calling for further research.

TINDALE (G. B.) & FRENCH, jr. (C.). **Grubs in Dried Fruits. Storage and Fumigation Tests.**—*Jl. Dept. Agric. Victoria*, xxv, pt. 7, pp. 411–413. Melbourne, July 1927.

In these tests boxes of dried fruit infested with larvae of *Plodia interpunctella*, Hb. (dried fruit moth), *Silvanus surinamensis*, L. (saw-toothed grain beetle), *Tribolium*, *Carpophilus*, and *Anobium* were subjected to cold storage or fumigation with hydrocyanic acid gas. In the fumigation tests the lids were removed and the boxes placed in the cyanide chamber over night. When examined 5 months later the condition of the fruit was good, but it was contaminated with insect excreta and webbing. The treatment undoubtedly kills all insects present at the time, but reinfestation may occur as a result of the hatching of eggs that are not killed by fumigation or as a result of further attacks by insects from outside sources.

The fruit in cold storage was kept at 34° and 25° F. Both temperatures were satisfactory; the lower would probably be the better where it was desired to reduce the period of storage. The quality of this fruit was excellent after 5 months' storage and quite free from insect excreta and webbing.

GRANDI (G.). **Hyménoptères sycophiles récoltés aux Iles Philippines par C.F. Baker, I. Agaonini. 22me contribution à la connaissance des insectes des figuiers.**—*Philippine Jl. Sci.*, xxxiii, no. 3, pp. 309–329, 7 pls. Manila, July 1927.

One new species of *Blastophaga*, three of *Ceratosolen* and one of *Eupristena* are described from the Philippines and one of *Ceratosolen* from Malaya, all from wild figs (*Ficus*).

DUTT (G. R.). **Aphids and Lady-bird Beetles.**—*Agric. Jl. India*, xxii, pt. 4, pp. 291–292. Calcutta, July 1927.

The value of biological control, particularly of Aphids by means of Coccinellids, is briefly discussed in the hope that this method may be more widely adopted in India. An experimental plot of lentil (*Ervum lens*) at Pusa was heavily infested by Aphids in February 1926. Coccinellids were collected from a neighbouring lucerne field and liberated in the lentil plot at the average rate of 1,000 a day on the 2nd, 3rd and 4th February. Some of the plants were in bags to avoid cross fertilisation; these were very heavily attacked and six Coccinellids were therefore introduced into each bag. By 15th February the Aphids had disappeared. It is pointed out that while in many cases the Coccinellids may appear in infested fields without being introduced, this usually occurs too late to be of material assistance in protecting the crop, so that their early introduction would be a great advantage.

FLETCHER (T. B.). **An Aphidid, on Sugarcane Roots, new to India.**—*Agric. Jl. India*, xxii, pt. 4, pp. 308–310, 4 figs. Calcutta, July 1927.

*Geoica spatulata*, Theo., has been found at Pusa on the underground roots of sugar-cane.

ANDREWS (E. A.). **Tea Green Fly (*Empoasca flavescens*, Fabr.).**—*Indian Tea Assoc. Sci. Dept. Qtrly. Jl.*, 1927, pt. 2, pp. 61–68. Calcutta, 1927.

Observations on *Empoasca flavescens*, F. (tea green-fly) [*R.A.E.*, A, xii, 182] have been continued, and the details of the duration of the different instars have consequently been slightly modified. There is a distinct seasonal variation, the rate of development increasing as the rainfall and temperature increase, and decreasing as they diminish, the maximum rate of development occurring from June to September, the wettest and hottest months. In the district under observation, there is a slight check in the increasing rate of development in May, when there is less rain and a distinct increase in the number of hours of bright sunshine. A comparison of the behaviour of the Jassid during the same months in different years showed that in spite of climatic variations, its usual rate of development remained approximately the same; it was also found that larvae emerging from the egg on the same day and reared to maturity under identical climatic conditions showed variations in the rate of development (variations of three and four days were common). From the point of view of climate, therefore, all years are equally favourable for the development of *E. flavescens*, and since there is variation in the stunting of the flush of the bush from year to year, this insect may not be the cause of this condition. Attempts made each season to produce the stunting effect on tea bushes kept in cages, by introducing numbers of *E. flavescens*, gave negative results, which increases the possibility that the appearance of the stunting effect at the time when the insects are most active is merely due to

coincidence. Furthermore it is not until October that the rate of development of the insects shows any definite decrease, whereas the stunting effect diminishes in August and September.

KALANDADZE (L.). **Die Wirkung von Arsenpräparaten auf die wichtigsten Forstschädlinge.** [The Effect of Arsenicals on the more important Forest Pests.]-*Zeitschr. angew. Ent.*, xiii, no. 1, pp. 1-96, 9 figs., 33 refs. Berlin, September 1927.

An account is given of a long series of laboratory experiments with arsenical insecticides against adults of *Melolontha melolontha* (*vulgaris*), and larvae of *Bupalus piniarius*, *Porthetria* (*Lymantria*) *dispar* and *Lymantria monacha*, all of which are important forest pests in Germany. Five proprietary arsenical dusts and one spray were used, most of the work dealing with the dusts. They were applied to the food-plants, which were stood in jars of water, the dusts being applied after the plants had been wetted with a mist spray. The amount of food eaten was ascertained according to Janisch's method [*R.A.E.*, A, xiv, 192], and the amount of arsenic in the dead insects by chemical analysis. The excreta were collected after each experiment, dried, and weighed. In all, 286 experiments were made with 3,717 insects. A full account is given of the experiments with each species, the results obtained in each larval instar being summarised separately.

The general conclusions reached include the following: Newly-hatched larvae and freshly-moulted ones die more quickly from the poison than others. As the caterpillars grow older the minimum lethal dose increases in a higher ratio than the increase in poison ingested with the larger quantity of food taken. Slightly poisoned larvae usually recovered if fed on unpoisoned food, but sometimes the resultant adults (*Lymantria monacha*) laid eggs that failed to hatch. The arsenic in surviving larvae passed to the pupae, the amount being somewhat decreased, and sometimes nearly all the pupae died as a result. The examination of moths resulting from caterpillars fed on poisoned food, and of the eggs of such moths, never showed traces of arsenic. The poison does not affect the duration of development of the surviving pupae, the mating of the adults, or oviposition. Arsenic has some external effect; adults of *M. melolontha* died more rapidly if there was external contact with the poison in addition to ingestion.

The following conclusions are drawn as regards the pests individually: Arsenical dusts are of no practical value against *M. melolontha*, as the beetles usually avoid the poisoned leaves. Other factors, such as the cessation of feeding in cold weather and the growing of the buds and leaves at the date of dusting, also influence the results unfavourably.

The effect of arsenical dusts are excellent on third or fourth instar larvae of *P. dispar*. Fifth instar larvae sometimes avoid poisoned material.

The best results with the dusts were obtained with *L. monacha*, particularly in the second and third larval instars, and also in the fourth. In no stage was poisoned material avoided.

The last instars (fourth and fifth) of *Bupalus piniarius* are very resistant to arsenic. Fifth-instar larvae were able to pupate even after ingesting a large amount of arsenic, though the pupae died in about a month. First and second instar larvae died rapidly. In no case did the caterpillars avoid poisoned material.

As a rule the dusts adhered better to conifer needles than to leaves. Heavy dusting may cause scorching of the young leaves and of the May shoots in conifers. The actual toxic effect of the dust is not the sole factor involved; adhesiveness must also be considered.

JANCKE (O.). **Beiträge zur Biologie und Bekämpfung des Maikäfers.** [Contributions to the Biology and Control of the May Beetle.]—*Zeitschr. angew. Ent.*, xiii, no. 1, pp. 97–107, 6 refs. Berlin, September 1927.

Observations were carried out to ascertain the depth underground at which the May beetle [*Melolontha*] deposits its eggs in various soils. In turf-soil 80 per cent. of the eggs were laid at a depth of 0·6–1·2 in., and the remainder within 4 in. of the surface. In stony plough-land the eggs occurred between 2·4 and 9 in., but they were too few in number to give a reliable result. In a manure-bed the percentages of eggs were 1·6, 1·6, 9·8, 57·3, 22·2 and 6·5 for depths of 0·4–4, 4–8, 8–12, 12–16, 16–20, and 20–24 in. respectively.

Of the females dissected, 89 per cent. had the normal number of 12 oviducts. Various observations are recorded of the number of eggs per female, the conclusion reached being that 15–25 eggs is the rule. The majority of females seem capable of ovipositing once only, but the few that oviposit a second time can lay twice the above figures. The numbers ascertained by Scheidter [*R.A.E.*, A, xiv, 314] and others are therefore maxima.

Experiments with insecticides, especially arsenical dusts, indicated that they are of little value. Feeding for 3–6 days on poisoned leaves had no effect, but when the period was 8 days, oviposition was prevented in one series of experiments and in another the eggs laid failed to hatch. Similarly, caterpillars of *Malacosoma neustria* that had been given poisoned material spun their cocoons, but died before pupating. Such after-effects should not be disregarded when considering the action of insecticides. A repellent effect of arsenicals was indicated by a mixed stand of oak and maple being abandoned by the beetles that had been infesting it, subsequent to dusting. In another case they did not attack a cherry orchard that had been sprayed.

BÖRNER (C.). **Ueber den Einfluss der Nahrung auf die Entwicklungsdauer von Pflanzenparasiten nach Untersuchungen an der Reblaus. Nebst allgemeinen Bemerkungen über Anfälligkeit, Resistenz und Immunität.** (Vorläufige Mitteilung.) [The Influence of Food on the Duration of Development of Enemies of Plants as studied on *Phylloxera*. With general Observations on Susceptibility, Resistance and Immunity. (Preliminary Communication.)]—*Zeitschr. angew. Ent.*, xiii, no. 1, pp. 108–128, 10 refs. Berlin, September 1927.

In addition to temperature and humidity, food is a basic factor in the speed of development of animals and plants, its effect being due to both quantity and quality. In the case of *Phylloxera*, development is slower on old leaves than on young ones, and it is possible that a retardation also occurs with the root-forms growing on woody roots as compared with those on young ones. The inadequate quantity of food

in old leaves is also recognisable in the smaller size of the Aphids found and in the smaller number of eggs.

In the same way experiments showed that *Aphis fabae* on broad beans requires longer in winter than in summer to produce a given number of young, even when the temperature is approximately the same. Under equal conditions of temperature and seasonal age of the plant, the size of the young Aphids and the number of eggs are in close relation to the curve of the food-assimilates in the food-plant, this curve being governed by the available amount of light. The character of this assimilation curve must be purely quantitative.

As regards food-quality it must be remembered that the sexuparae of *Phylloxera* and leaf Aphids generally only occur in given seasonal conditions of the food-plants. Thus the production of males among the otherwise parthenogenetic females is due to a change in food-quality. Differences in food-quality also appear in the comparison of speeds of development, and compared with its optimum speed the growth of *Phylloxera* on resistant and immune vines is more or less slow under equal conditions of temperature, humidity, growth of shoots and season of the year. The speeds of development of *P. vastatrix* and *P. vitifolii* on the leaves of various vines are tabulated and discussed. As regards the causes of the retarded development due to food conditions, it is found that such retardation acts as if the Aphids had been deprived of food, although their feeding is beyond doubt. It would seem that with unsuitable vines there is no production of nutritive substances in response to the punctures by the Aphids, so that the formation of galls ceases and the Aphids starve.

The food-factor must in many cases be involved to an important extent in cyclical biological changes in living organisms. It is impossible to indicate the developmental phases of, for example, an insect by the temperature curve alone, nor does the simultaneous consideration of humidity prove sufficient. It is necessary also to consider the food-conditions under the varied seasonal effects, in order to represent by a formula special biological conditions. These observations on the retardation of development of *Phylloxera* on resistant and immune vines may indicate the explanation of the adaptations of individual generative forms of leaf Aphids to given seasonal conditions of the food-plant. In the case of the maple leaf Aphids, *Chaitophorus aceris* and *C. testudinatus*, the development of the young larvae of the sexuparae coincides with the beginning of the maturing of the wood and with the summer increase of the osmotic power of the maple, while in the case of such Aphids as *Chermes (Dreyfusia) nüsslini* and *C. (Cnaphalodes) strobilobius*, the development in spring coincides with the beginning of the sap-flow soon after the winter maximum of the osmotic power has been reached. There must be certain physiological processes in the plant that incite the beginning of development of the resting forms of these Aphids. In all these cases, temperature decides the duration of development, but has no effect on its commencement. The artificial check in growth in *Phylloxera* produced by transfer to unsuitable vines is a result of the specialisation of the Aphid to certain vines. The specialisation of *Chaitophorus* and *Chermes* refers to adaptations to given seasonal changes on one and the same susceptible plant.

The determination of the developmental checks discussed here may supply valuable assistance in the selection of plants resistant to bacterial, vegetable and animal enemies.

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Aphis, Red Spruce (see *Chermes strobilobius*).  
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*Zenillia normula*, sp. n., parasite of *Acraea acerata* in Uganda, **459**.

*Zenillia vara*, sp. n., parasite of *Arctornis producta* in Zanzibar, **459**; in Kenya, **459**.

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- Zeuzera pyrina* (Leopard Moth), in orchards in Britain, **55**; intercepted in California, **88**; on willow in Germany, **10**; bionomics of, in Palestine, **343**; in Pennsylvania, **72**; measures against, **10, 343**.
- Zicrona coerulea*, predacious on *Haltica ampelophaga* in France, **59**.
- Zilla spinosa*, new Coccid on, in Egypt, **115**.
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